TOBER

Making Six-Foot Horn—Page 649

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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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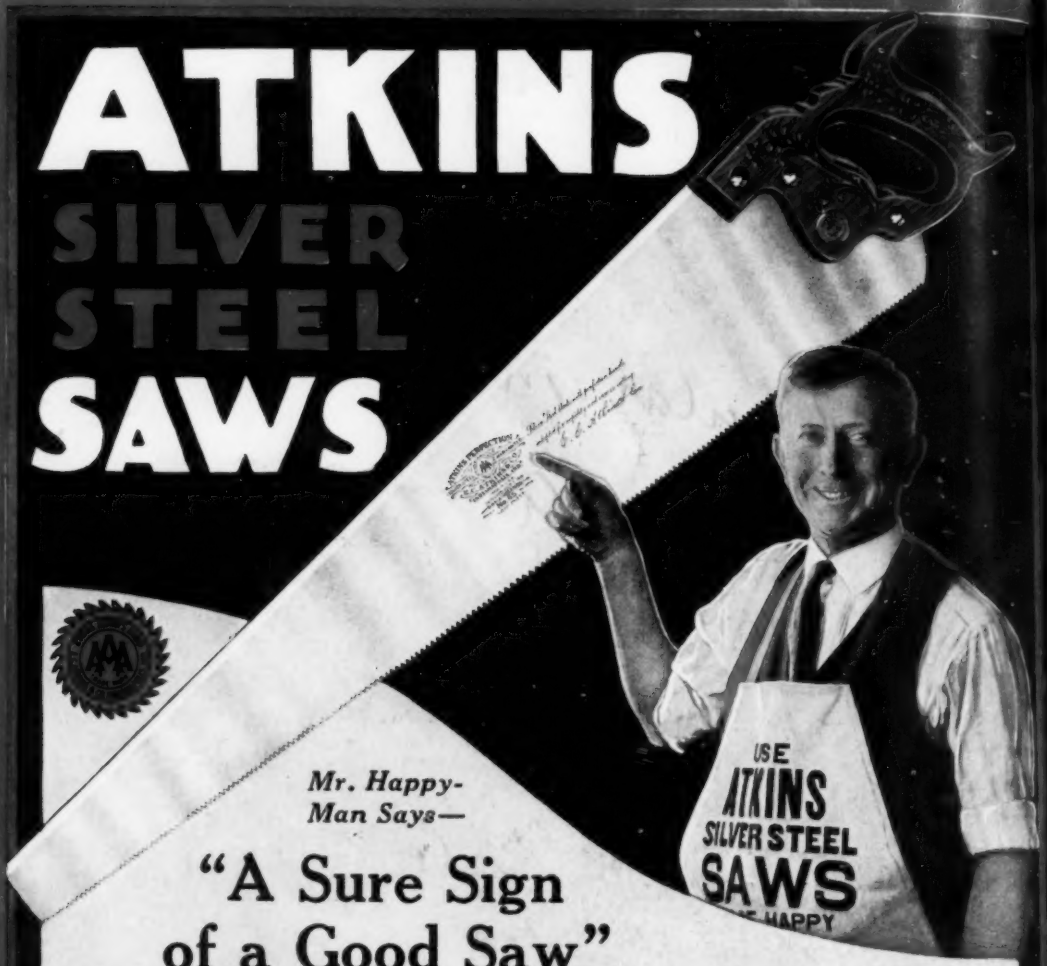
SEE PAGE 544

ATKINS
SILVER STEEL SAWS



Mr. Happy-Man Says—

"A Sure Sign of a Good Saw"

LOOK for the ATKINS name on the blade when you buy a saw. This world-famous trade-mark guarantees you a better saw—one that will save you time, money and labor every day you use it.

Your hardware dealer will show you a genuine ATKINS "Silver Steel" Saw ready for a lifetime of better service in your home, or in your work. It not only cuts easier and faster, but outwears many "cheap" saws.

No matter whether you want to cut wood, metal, stone, bone or any other material—there's an ATKINS Saw ready to give better service. Ask or write for one of our free folders, "Saws in the Home," "Saw Sense" or "Saws on the Farm." YOUR hardware dealer will gladly show why "It Pays To Buy Better Tools!"

E. C. ATKINS & CO., Est. 1857, **426 S. Ills. St., Indianapolis, Ind.**

Leading Manufacturers of Highest Grade Saws for Every Use; Saw Tools, Saw Specialties, Plastering Trowels, Machine Knives, Grinding Wheels and Files.

Restored Enchantment

This is the Eveready Layerbilt that gives you Battery Power for the longest time and the least money

Radio is better with Battery Power

THERE is no doubt of it—radio is better with Battery Power. And never was radio so worthy of the perfection of reception that batteries, and batteries alone, make possible. Today more than ever you need what batteries give—pure DC, Direct Current, electricity that flows smoothly, quietly, noiselessly, into your receiver. Then you are unconscious of its mechanism, for you do not hear it humming, buzzing, crackling. The enchantment of the program is complete.

Batteries themselves have improved, as has radio. Today they are equal to the demands of the modern receiver. Power your set with the Eveready Layerbilt "B" Battery No. 486. This is the battery whose unique, exclusive construction makes it last longer than any other Eveready. In most homes a set of Layerbilts lasts an entire season.

For the best in radio, use the Layerbilt. Could more be said?

EVEREADY
Radio Batteries
–they last longer

At a turn of the dial a radio program comes to you. It is clear. It is true. It is natural. You thank the powers of nature that have once more brought quiet to the distant reaches of the radio-swept air. You are grateful to the broadcasters whose programs were never so enjoyable, so enchanting. You call down blessings upon the authority that has allotted to each station its proper place. And, if you are radio-wise, you'll be thankful that you bought a new set of "B" batteries to make the most out of radio's newest and most glorious season.

NATIONAL CARBON CO., INC., New York—San Francisco
Unit of Union Carbide UCC *and Carbon Corporation*

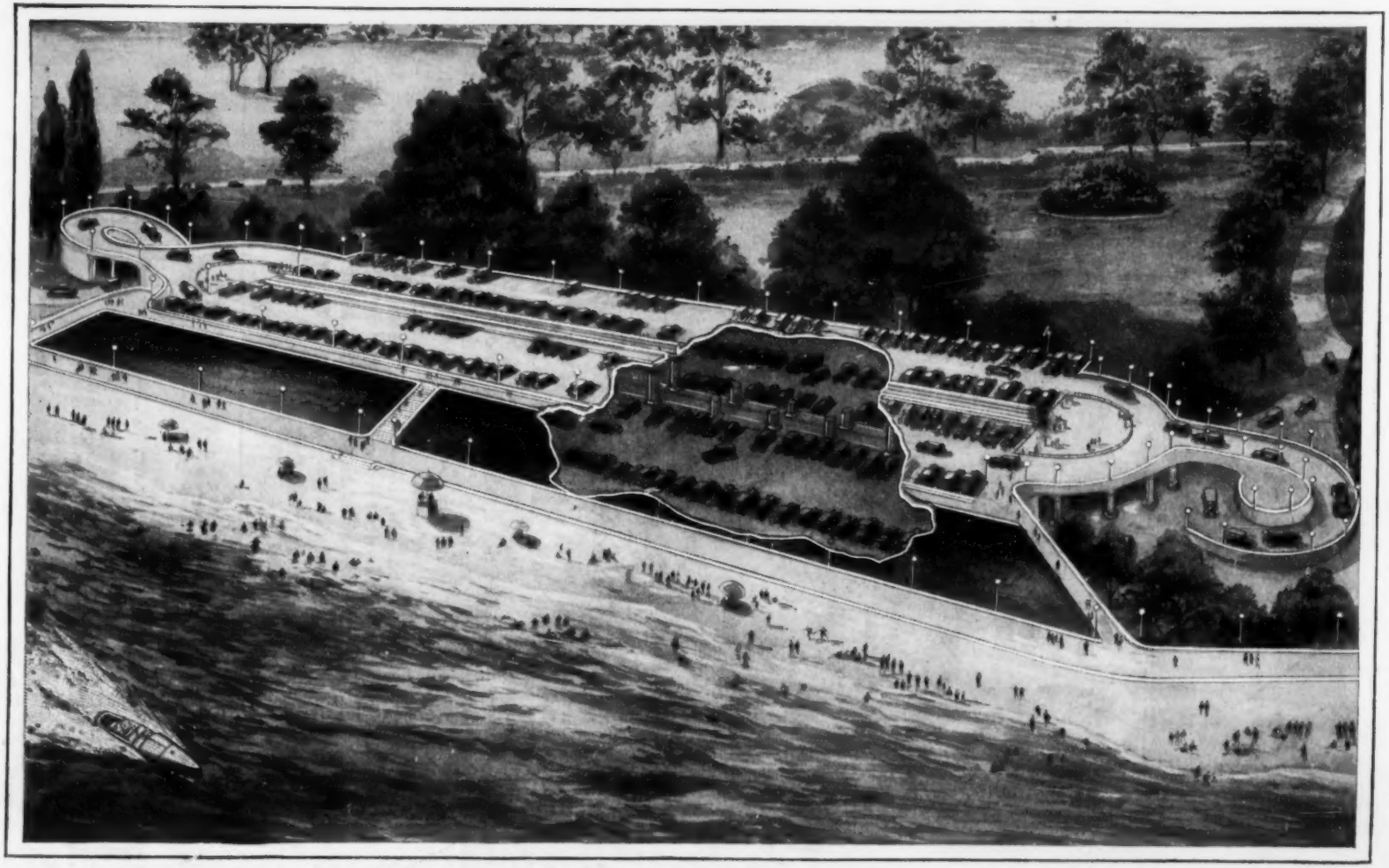
Tuesday night is Eveready Hour Night—9 P. M., Eastern Standard Time

WEAF–*New York*	WSAI–*Cincinnati*	KSD–*St. Louis*
WJAR–*Providence*	WTAM–*Cleveland*	WRC–*Washington*
WEEI–*Boston*	WWJ–*Detroit*	WGY–*Schenectady*
WDAF–*Kansas City*	WGN–*Chicago*	WHAS–*Louisville*
WFI–*Philadelphia*	WOC–*Davenport*	WSB–*Atlanta*
WGR–*Buffalo*	WCCO–*Minneapolis*, *St. Paul*	WSM–*Nashville*
WCAE–*Pittsburgh*		WMC–*Memphis*

Pacific Coast Stations—9 P. M., Pacific Standard Time

KPO–KGO–*San Francisco* KFI–*Los Angeles*
KFOA–KOMO–*Seattle* KGW–*Portland*

Have you heard the new Victor record by the Eveready Hour Group—orchestra and singers—in Middleton's Down South Overture and Dvořák's Goin' Home?



Automobile Parking Congestion in the Neighborhood of Bathing Beaches Has Become So Great in Chicago That Commissioners of Lincoln Park Have Planned This Double-Deck Storage Space to Be Built at a New Beach Being Constructed on Made Land in Lake Michigan—**See Page 534**

Popular Mechanics Magazine
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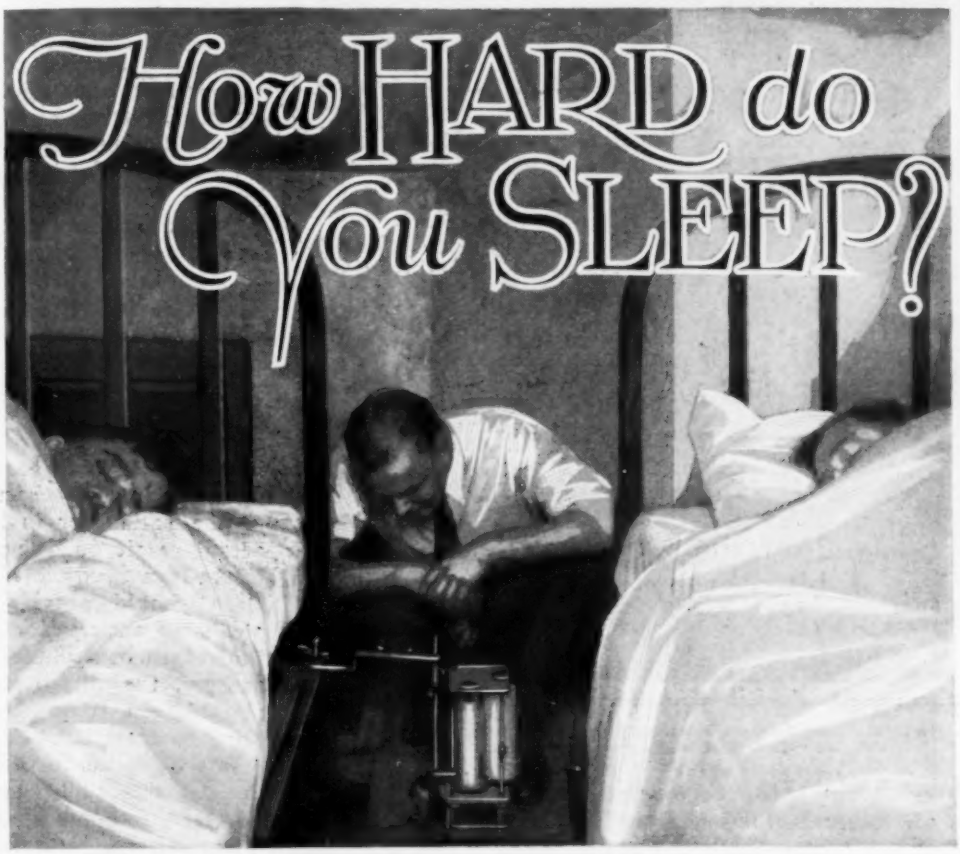
No. 48 OCTOBER, 1927 No. 4

How HARD do You SLEEP?

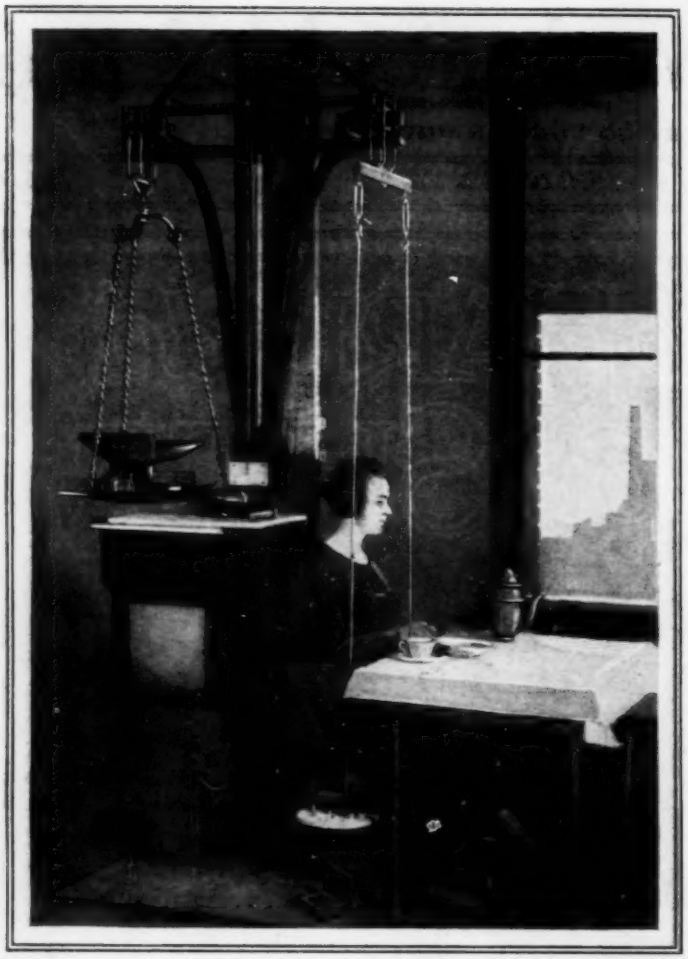


Clockwork-Driven Chart Used to Record Every Restless Movement of Sleepers Undergoing Tests at the Mellon Institute; It Also Charts the Exact Time of Each Movement

SLEEP, instead of being a period of unbroken rest for several hours, is a series of short naps, interspersed with turns and movements, according to investigators of the Mellon institute, Pittsburgh, who have been studying the sleeping habits of twenty-one students for more than a year.

Ten to fifteen minutes of deep sleep proved to be the average for the class, but each one was disclosed to have a certain normal sleep wave or rhythm distinct to himself. Physical or mental strain, financial or heart worries or disease change the sleep wave, breaking it with more frequent tossing and turning, in some cases, or lengthening it in others.

A special machine invented for the tests by Dr. H. M. Johnson, in charge of the experiments, was attached to each bed in the dormitory. It records, on a moving strip of paper, every movement the occupant makes, and, as the motion of the paper is timed, shows the duration of each deep-sleep period and the recurrence of



In Nutrition Tests, Subjects Are Seated in Chairs Hung from Balances in Order That Gain in Weight May Be Determined

disturbances. It is expected that the tests may be useful in the study and treatment of disease. Recording machines are being installed in two hospitals to gather data on this phase of sleep alone.

One of the subjects in the experiments contracted influenza. The night before the onslaught of the disease, the average rest period was more than doubled in length, just the opposite of the conditions that German investigators found to be associated with sleeping sickness. The increased periods of still sleep continued throughout the progress of the disease, but after recovery, the subject returned to his normal sleep wave.

"Of course," says Dr. Johnson, "it is well established, as a matter of common experience, that worry disturbs rest. The discovery of this fact is not the valuable point. What is valuable is that a method has been found which will show in what manner and to what extent the disturbance acts, and which is independent of the personal report and personal impressions of the patient.

"In certain nervous and mental disorders, systematic worries, which are usually ill-founded, and which often persist for weeks, are a characteristic symptom. In fact, they constitute the principal source of unfitness for place in normal society. The treatment consists largely of rest and re-education. An important hindrance to treatment lies in the reticence of the patient or in his actual resort to deception. If a study of his sleep should provide a means of anticipation of the return of a phase of anxiety, the physician might be able to do something to avert it."

In the Mellon institute tests it was discovered that not all people need the same kind of rest. Some of the students worked better after a "warming up" process in the morning, which involved partial tiring of the body. Mental tests were given regularly, and all but one of twenty-one subjects showed more alertness at the end of the day, when well tired, than in the morning.

"When we allow them only seven and three-quarters hours in bed," says Dr. Johnson, "the output at night is about six and a half per cent better than in the morning. When we allow them eight hours in bed they rest more quietly, as well as longer, and their output at night becomes ten per cent higher.

"It looks as though the longer a person

tays in bed—within such limits as these—the more quietly he rests while there, and, possibly, the higher the degree of recuperation he attains. By this token, therefore, the less fit for work he will be in the early part of the day, since he must undergo a longer winding-up process to make use of the gain, and the more fit he is by night, since he is not so near the actual exhaustion of his reserve.

"Many people, if they must do detailed thinking in the morning, will find a good preparation to be a good walk, a game of golf, or a half hour's work in the garden, so that when they attack the day's task they will be sufficiently fatigued to settle down to it."

Mild fatigue, Dr. Johnson says, is conducive to effectual work, and is also an important agent of pleasure, through the thrills that attend the discharging of the stored-up energy of the body cells, gained through a night's sleep.

WHIRLING DISK SHOOTS SPARKS OF DIFFERENT COLORS

Showers of colored sparks are produced by a whirling-disk device recently introduced in Germany. The action is accomplished by little pegs that come in contact with an emery disk. The pressure is regulated to produce ample sparks but prevents useless waste. The color effect is gained by the tinted panes in the disk.

Wheel in Position for Spinning and in Action, Showing How It Is Operated and Sparks Produced

For the Golfer Who Wants to Cultivate the Correct Body Swing; Iron Practice Ring in Use

GOLF PRACTICE IN IRON CIRCLE DEVELOPS PROPER SWING

Control of body sway is said to be an important factor in efficient golf, and to develop this, a Toledo player has introduced an iron practice ring. It rests on firm supports and incloses the user's waist with sufficient space for freedom of motion but preventing exaggerated effort. According to the inventor, better position and more accurate strokes are cultivated by this aid.

MIX CRUSHED ICE IN CONCRETE TO FORM POROUS BLOCKS

Add crushed ice or snow to cement and sand during the mixing process and obtain concrete units honeycombed with minute pores, says the latest building recipe from Finland. The water from the melting ice soon evaporates, leaving the small holes and forming a cellular structure, especially suited for insulating purposes.

Battleships of British Navy Decorated with Electric Lights for Recent Maneuvers at Portsmouth; Searchlights and Bursting Star Shells Added Brilliance to the Display

BATTLE FLEET OF ENGLAND IN ELECTRIC PAGEANT

Warships tricked out in vast strings of electric lights were paraded before people on shore at the recent British navy maneuvers at Portsmouth. The lines of lights outlined hulls, conning towers, guns and masts. Huge searchlights swept the sky, while star shells trailed long streamers of colored light across the darkness.

ROLLERS FOR PIANO KEYBOARD HELP IN SCALE PLAYING

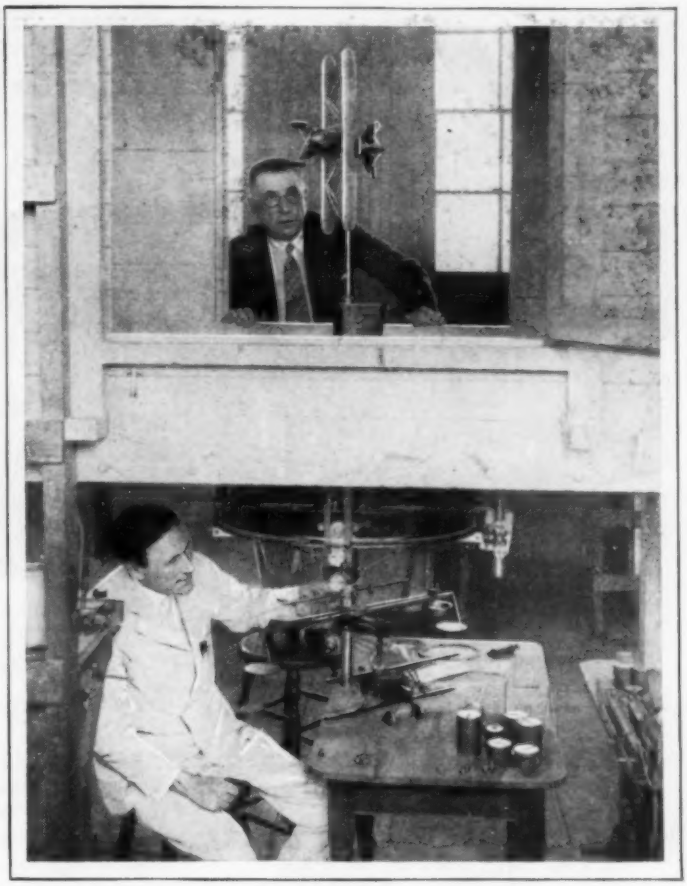
Combinations of sound heretofore impossible on an ordinary keyboard are said to be produced easily with the aid of rollers on the keys, one of the principal features of a grand piano recently introduced. They are intended to assist in the glissando passages where the musician is instructed to produce a brilliant scale by sliding the back of the finger along the keys. The rollers govern both the white and black keys and are so arranged that chromatic sliding of the fingers singly or in various forms is easily attained.

Roller Keyboard for Fast Piano Runs

DEVELOPMENT OF MARINE RADIO VICTORY FOR VACUUM TUBE

How the vacuum tube has revolutionized marine radio is shown by the fact that it was only in 1920 that a chain of coastal broadcasting centers was established using the old system. All were operating on but two wavelengths, and there was a bedlam of interference. It has been no easy matter to discard the hundreds of obsolete transmitters in use on ships, but the work of changing from spark to vacuum tube has been going on steadily during the past two years. Already several hundred ships are so equipped, or will be very shortly. Spark signals are becoming a rarity, except for occasional small foreign ships. Vacuum-tube transmission has more than

justified expectations. With the vast increase in distances spanned, ships are now keeping in touch with land stations on the transatlantic course. The static-infested Gulf of Mexico finds vacuum-tube transmitters getting through hundreds of miles of space in broad daylight, with precision and certainty. But the climax of vacuum-tube technique is to be found at the elbow of Cape Cod. Here the visitor is confronted with the busiest scene imaginable, both to the eye and to the ear. There are rows of operating tables, some for the radio circuits that reach out to ships at sea, and others for the telegraph lines stretching to the offices in New York and Boston, the scene suggesting a busy telephone central. The operators are seated before tables with high backs containing the receivers. A supervisor assigns to each ship an operator who tunes in and receives the messages, pounding away the radiograms on his typewriter just as fast as the distant vessels can "shoot" them in.



Testing Model Airplanes in Wind Tunnel for Development of Greater Speed in Finished Ships

BAIT CAN HAS SELF-CLOSING LID AND CLAMP TO FIT BELT

With a strong spring lid that closes tightly of itself, a bait can now on the market is intended to add to the joys of fishing. An additional feature is a steel clamp to be slipped on the belt, pocket or creel for holding the can in position. Green lacquer protects it against rust.

GREATER SPEED FOR AIRPLANES OBJECT OF TUNNEL TESTS

Successful development of aviation depends, in a great measure, on faster speed for planes, according to officials of a western company, and with that end in view, they have been conducting a series of interesting tests with models in a wind tunnel at the California institute of technology. The miniature ships are carefully constructed to scale, accurately weighed, and their resistance to air currents and behavior in a powerful wind stream noted, so that data may be obtained as to the probable performance of real ships built on those patterns.

¶In Constantinople, blind and dumb persons wear labels to decrease the likelihood of motor accidents.

Enter the "Flying Auto"; the Roomy, Glass-Inclosed Cabin Affords a Wide View and Comfortable Riding; Propellers Are Driven through Conical Gears and Wheels Fold into Floats for Water Landings

BODY LIKE AUTO SEDAN MARKS NEW "FLIVVER" PLANE

An airplane which has a cabin inclosed by wide glass windows, affording an all-around view equal to that in an automobile sedan, is being produced in Germany by the famous Junkers works as a personal machine for owner-pilots who want to fly for business or pleasure. The machine is notable for its contrast to the usual cabin plane, in which the cabin consists mostly of walls with a few very small windows, usually covered by sheets of celluloid instead of plate glass. The Junkers machine has two two-cycle motors, driving the propellers through conical gears. It is an amphibian, and the landing wheels are so arranged that when drawn up at right angles to their normal position they become part of the floats for alighting on water.

DOUBLE-DECK PARKING GARAGE FOR NEW BATHING BEACH

Congestion due to parked automobiles in the vicinity of Chicago bathing beaches has become so great that when commissioners of Lincoln park planned a new beach, to be built on made land in Lake Michigan a half mile from the present municipal bathing house, they provided for a double-decked parking garage with a capacity of hundreds of cars. The city already has many blocks of double-decked streets, with heavy traffic relegated to the lower levels, and the beach-parking garage will follow the same general design. Circular ramps at either end of the structure, which will be about two city blocks in length, give access to the upper level. By parking cars two deep, considerable space will be saved for baseball diamonds, tennis courts, golf links, a ski slide and other sports. Boulevard lamps around the rim will light the parking space at night, while a row of trees will largely conceal it by day.

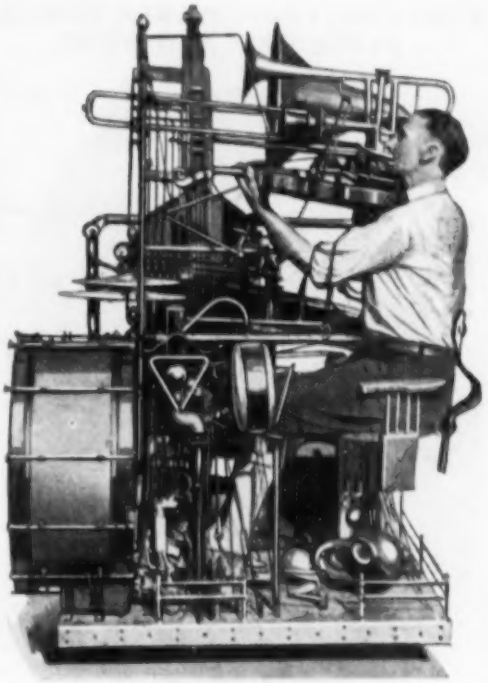
NEW CLOTHING FABRIC PASSES ULTRAVIOLET RAYS

Full benefit of the sun's rays may now be enjoyed even while wearing clothing, according to reports of a new fabric which is said to permit the ultraviolet rays to pass through and reach the skin. The cloth was tested in New York laboratories with sports costumes, and results showed that the chemically manufactured material allowed the helpful rays to bombard the wearer as though he were totally unclothed. The cloth somewhat resembles silk and is mixed with a small percentage of light wool to create colored patterns. An interesting feature of the tests was the discovery that certain kinds of perfumes obstruct the rays, so that persons wishing to enjoy the full benefit of the sun while wearing the cloth, were cautioned not to use perfume on the fabric.

EXERCISER FOR REDUCING FITS IN SMALL SPACE

Occupying but little floor space, and, when not in use, rolled away in a closet or other convenient room, where it stands upright against the wall, a roller platform for reducing exercises has been introduced. It is a combination rowing and massaging machine, some fifteen different exercises being available from it. While most are intended to reduce the weight, there are stunts for the arms and legs, chest and back, which promote strength and suppleness. A few minutes a day with the outfit is said to be sufficient for desirable results, and, besides, the exercises are a source of enjoyment.

Exerciser Provides Fifteen Stunts for Reducing



He Plays Twenty-Two Different Instruments, Using His Hands, Feet, Knees and Mouth

ONE MAN PLAYS ORCHESTRA OF TWENTY-TWO PIECES

Parts salvaged from automobiles and locomotives have been used by a Minneapolis man in the construction of a twenty-two-piece orchestra assembly which he can play alone. It has string, wind and percussion instruments and the operator uses his hands, feet, knees and mouth, simultaneously at times, when playing selections. An amplifier is arranged to increase the volume of the tones from the string instruments so that they will not be drowned out by the brass.

AUTOMATIC "SOS" FOR SHIPS HELPS SEA SAFETY

Even if the wireless operator is not on duty, an SOS signal from another ship would not be missed with special apparatus devised in England. It is so adjusted that reception of the distress signal rings a bell in the wireless room as well as on the captain's bridge, so that attention to the call is summoned at once, even when the radio operator is not at his regular post.

PORTABLE FRUIT-PICKER TOWER SAVES TIME AND WORK

Tower in Operation; Fruit Is Placed in Small Baskets on Endless Belt and Dumped into Box Below

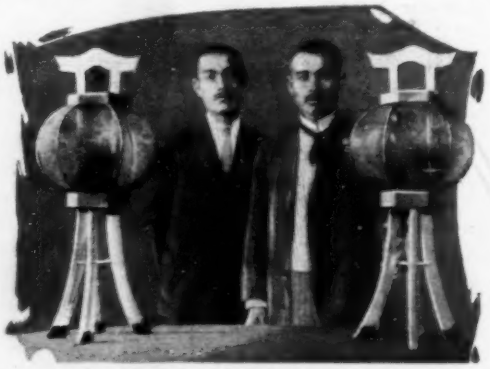
Faster picking and less damage to the fruit are claimed for a portable-tower apparatus a California grower has constructed for gathering oranges, lemons and other crops. It is easily moved about on wheels, and a special feature is the endless-belt conveyor with small boxes, by which the fruit is lowered into larger containers or a hammock at the bottom, saving repeated trips up and down the usual ladder. This conveyor operates by gravity and is made to dump the fruit automatically.

FORTUNE WAITS IN DISCOVERY OF PLATINUM PROCESS

In the shelter of the towering, poisonously white dumps of crushed gold ore that overlook the great African mining city of Johannesburg, stands an unpretentious stone building in which several scientists are seeking a missing ingredient that means extra millions to the mining magnates of the great southern continent —a way of extracting South Africa's most precious metal, platinum. This metal is found in quantities, but no practical way is known of separating it from the rock in which nature hid it. Like all great discoveries, the principle of extracting platinum is probably very simple—if it can only be found. As one geologist crudely put it: "All they need to add to the stew is a pinch of salt." A tantalizing search indeed, but one that is not being conducted haphazardly. Great masses of statistics are accumulating and gradually—very gradually—some pointers to the unraveling of the mystery are being found, as the facts become tabulated. Thirty years ago, the same problem balked the refining of gold on the Rand. Ten billion dollars' worth of ore lay ready to be dug out as soon as a way was found to separate it from the rock, but not until a battalion of scientists had experimented systematically for a decade did the obvious but essential fact turn up—the simple information that gold combined with cyanide of potassium. And now a fortune again waits a single discovery which will do for platinum what the cyanide process did for gold.

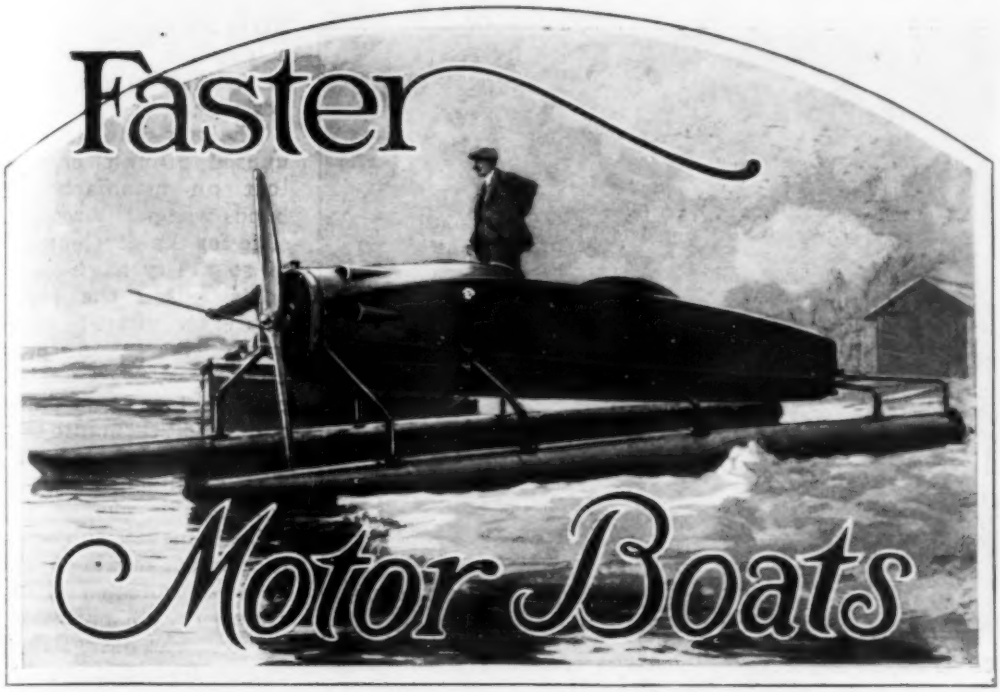
BOWLS OF FIREFLIES CITY'S GIFT TO JAPANESE PRINCESS

Members of the juvenile Red Cross society of Gifu, a city in central Japan, recently captured more than 1,000 fireflies and placed them in two bowls as a gift to the emperor's daughter. In some localities, fireflies are used as a source of illumination and as personal adornment. There are over eighty species of them.



Unique Gift of Japanese Children to the Emperor's Daughter; Bowls Contain More Than 1,000 Fireflies

Faster Motor Boats



A Pontoon Boat, Built like an Airplane Body with Two Long Floats, Has Been Tested on the Great Lakes; It Will Run in Four Inches of Water, or Can Skim across Ice in Winter

WITH land and the air conquered by space-devouring speed—209 miles an hour for Maj. Segrave's racing automobile and better than 250 miles an hour for Schneider cup seaplanes—both builders are concentrating on the conquest of the last remaining element, water.

Gar Wood's dream of a 100-mile an hour boat big enough to cross the Atlantic—announced two years ago after his record-breaking dash down the Hudson from Albany to New York—remains unfulfilled, but eighty miles an hour has been attained, and the century mark is in sight.

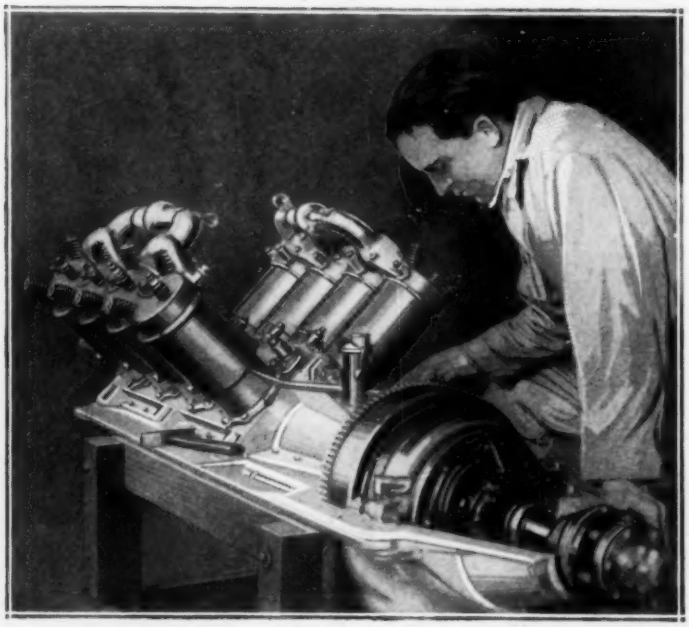
America, in the years since the war, has become the home of the high-speed boat. When Maj. Segrave came to Daytona with his huge racing machine, to travel faster than man has ever traveled over the ground, Gar Wood and others took him out for trial spins in their high-powered boats and sent him home a convert. He raced his big double-engined car just once when he got back to England, to let the home folks see it in action, and then announced his retirement from the track to devote all his time to high-speed boats.

And, strangely enough, his first entry in water racing was a pair of little outboard-motor boats, flat-bottomed step hydroplanes of the type that has set up records of better than twenty-eight miles an hour. For the bigger races later in the season, he planned to pilot a craft capable of making forty miles an hour.

Speed on the water, however, is not confined to races, or to professional pilots out for cups and prizes. Thousands of fast but comfortable boats, as easy to handle as an automobile and with many of the automobile's luxuries, from leather seats and sedan tops down to electric cigar lighters on the instrument board, are being turned out in factories on the Great Lakes, around Long Island sound, and in the far west.

They range from fast little day runabouts—corresponding to the sport roadsters of the highways—up to the limousines of the seas, and even on into the camping-coach type, comfortable big cruisers with berths for four to six people, a well-equipped galley and all the comforts of home.

The joys of the open road, which disappeared when automobiles became so



Curtiss Airplane Engine Being Dismantled to Be Rebuilt as a Marine Motor for High-Speed Boat

numerous that it was impossible to move out of any large city faster than a snail's pace on Sundays and holidays, still cling to the water, for there is plenty of space and plenty of changing scenery.

Marine motorists, though, demand the same, or nearly the same, speed they attained with automobiles on land, and it is that demand which has almost revolutionized boat building in the last few years. For speed on the water can only be attained at the cost of economy of operation, so, before the war, practically all power boats, with the exception of a few out-and-out racing machines, were built to chug along at a modest eight to ten miles an hour. Roughly speaking, to jump from ten to fifteen miles an hour about doubles the operating cost of a boat, and to go from fifteen to twenty may double it again, and so on up the scale. A ten-mile cruiser can jog along and conserve gasoline as well as a modestly powered automobile, but the marine motorist who wants high speed pays for it in gasoline consumption.

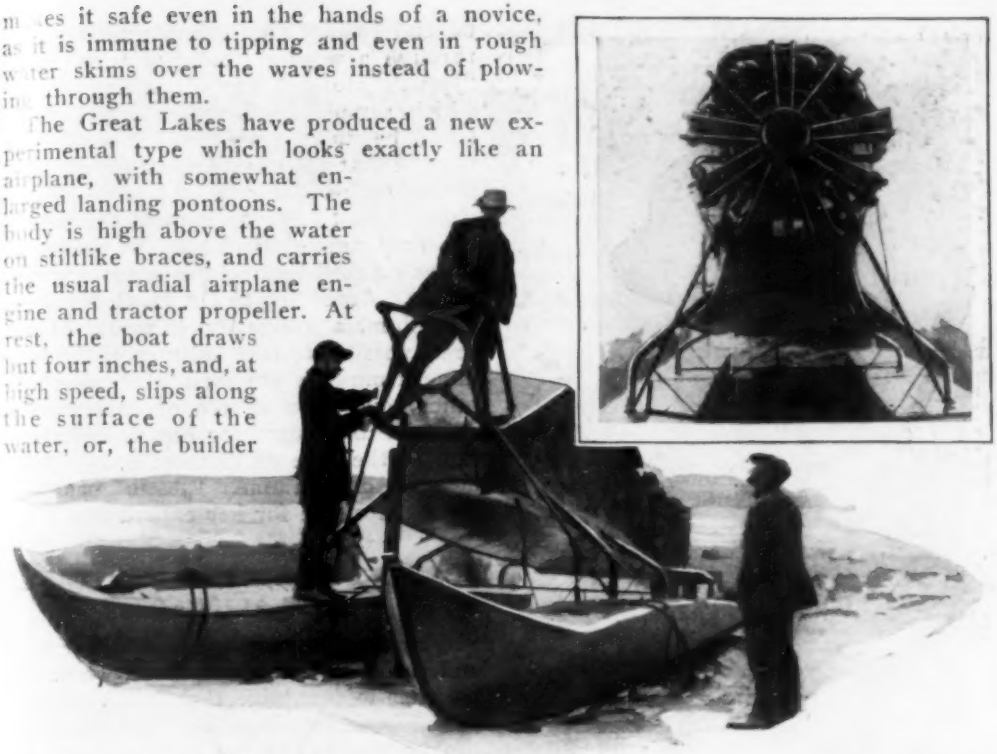
To get forty or fifty miles an hour out of a twenty-six, twenty-eight or thirty-foot day cruiser, which is the usual seven-passenger car on the water, requires from 200 to 300 horsepower and a gasoline consumption of one-half to one gallon per mile.

The war-time stock of unused aircraft engines left on manufacturers' hands was partly responsible for the development of so many high-speed boats within the space of a few years. One boat maker alone purchased 2,500 Curtiss engines, tore them down and rebuilt them into marine motors for his boats. The rebuilding required considerable change, for a boat engine, subjected to frequent wetting, must be well protected to insure steady operation. Anyone who has watched one of the fast-racing hydroplanes capsize on a turn, sink to the bottom, while the crew, buoyed by life preservers, floats around waiting to be rescued, and then watched the sunken boat being fished up by a derrick to go back into the race next day, can appreciate the amount of punishment a well-built marine motor will stand. Rust-proof monel-metal jackets and complete coverage of the electrical apparatus are essential.

The search for speed isn't confined to putting bigger motors in standard types of boats. Designers have imitated the airplane by utilizing aerial propellers, by adopting seaplane fuselages and pontoons, and, in at least one case, by producing a hull that looks like an ordinary boat which has been sawn in two down its center line and the two halves put together wrong, the cut surfaces boarded up at the outside and the former outsides stuck together. The result is a curious hull with a tunnel running down its center, and with straight sides that, out of the water, look like runners, so it is called a sea sled. Driven by a 200-horsepower motor, it will ride over the wave tops at forty miles an hour, and without any of the unsteadiness of the usual round or V-bottomed boat. Its unusual construction

m es it safe even in the hands of a novice, as it is immune to tipping and even in rough w ter skims over the waves instead of plowing through them.

The Great Lakes have produced a new experimental type which looks exactly like an airplane, with somewhat enlarged landing pontoons. The body is high above the water on stiltlike braces, and carries the usual radial airplane engine and tractor propeller. At rest, the boat draws but four inches, and, at high speed, slips along the surface of the water, or, the builder



The Radial Aviation Engine of the Pontoon Boat, and the Craft Itself Ready to Have the Power Plant Mounted; It Follows Airplane Design, But Is Much Sturdier

claims, it can be used with equal ease in the winter on the ice.

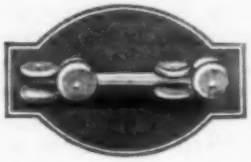
The airplane-propeller boat has found favor in some localities on inland lakes because it cannot be fouled by water lilies or other marine growth—the chief bugaboo of the water motorist. And because of its light draft it can be taken into shallow water where boats of more conventional design would be barred.

The demand for reliable marine power plants has grown so much in recent years that several automobile manufacturers have turned out marine editions of their regular engines, to enable them to participate in the business. Also, there are several companies which produce the necessary parts to convert secondhand Ford engines into marine units.

The surplus airplane-engine stock is far from exhausted, but conversions, outside of a well-equipped machine shop or a factory concentrating on the business, is an expensive process. The government has a large stock of new Liberty motors for sale, but the cost of the necessary changes has kept all but a few Libertys out of boats. Also, the fuel consumption, at the rate of eighteen gallons an hour, makes the Liberty far from an inexpensive power plant outside of its natural habitat in a 150-mile an hour plane. In a boat with a speed of thirty-five to forty miles an hour, the fuel cost becomes an important item.

EIGHT-WHEELED TOY WAGON WILL NOT UPSET

Equipped with eight wheels, so arranged that they prevent overturning, a toy wagon for young children affords amusement and spares floors, as the sides cannot drag and scratch surfaces. There are four wheels on each side, set to clear the floor when they are not in use.



Paper Raincoats for Emergency Service Have Proved Efficient for Sea Voyages as Well as for Street Wear

PAPER RAINCOAT WEIGHS LITTLE AND KEEPS WEARER COOL

For steamer voyages, and on other occasions when a great amount of walking through heavy traffic is not necessary, raincoats made of waterproof paper have been introduced. As they do not cling so closely as those of rubber, they afford more ventilation and hence are cooler, weigh but little and can be folded up in small space. Modern methods of waterproofing paper have been developed to such a high degree of efficiency that swimming suits have been made of the material.

COW MAKES OWN VITAMINE B FOOD TESTS SHOW

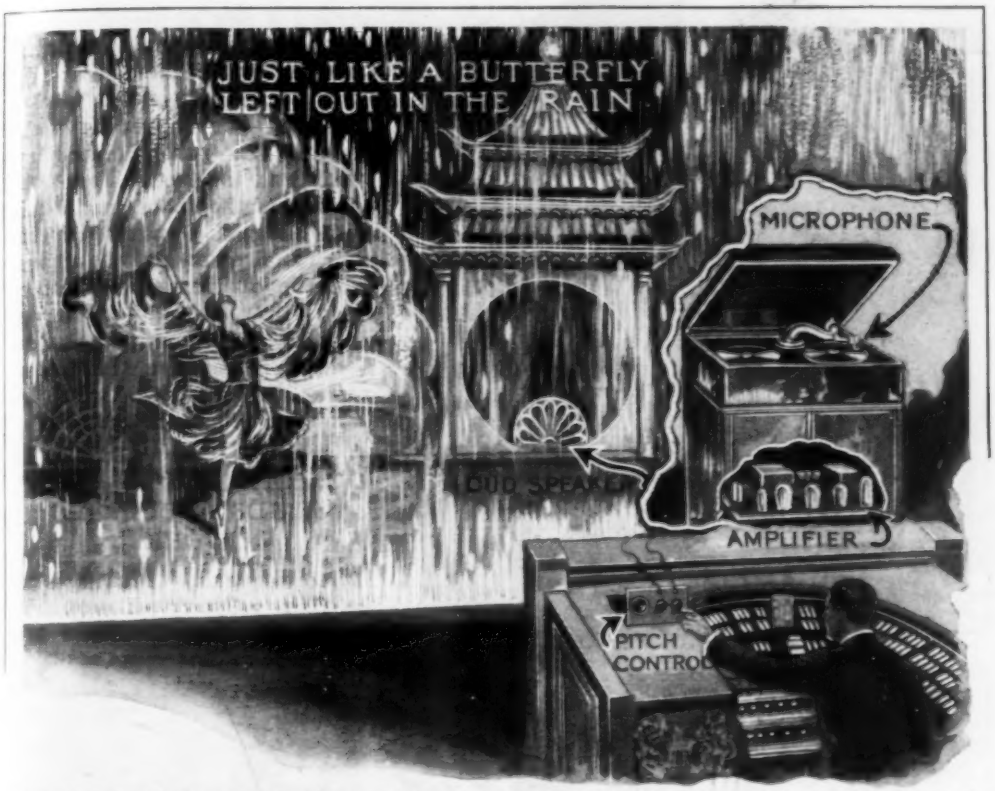
That the cow may be able to serve the human race in an additionally important manner is seen as a result of interesting observations on "Jessie," scientific pet cow of the Pennsylvania State college. "Jessie" has been deprived of vitamine B, an essential material of nutrition, but it was found that her milk contained the substance and she thrived as well as cows with normal food. The secret was revealed through a window that had been cut in "Jessie's" stomach, a small opening through which samples of partly digested food could be taken out and analyzed. It showed that the vitamine was produced in a sort of incubator in one of the cow's stomachs. So far as known, the cow is the only animal that has the ability to thrive on feed lacking this necessary substance. According to Dr. H. C. Sherman, of Columbia university, it would be entirely possible to take cultures of the vitamine from the stomach of "Jessie" or other cows as a source of concentrated material to be used for human consumption in the case of diseases caused by a lack of the vitamine. "Jessie" has been none the worse for her experience.

FOLDING-BRACKET AUTO TABLE FITS ALL CARS

Weighing but five and one-half pounds and easily carried in the hand when collapsed, a folding table, that fits on the back of the front auto seat, has many uses. It can be attached to the robe rail or cord, or to special loops provided for cars not equipped with robe carriers. It is especially serviceable on camping trips for serving meals, playing cards or as a writing table. There are no fixtures to mar or damage the car or upholstery.

Typical Uses for the Folding Table inside Auto; When Collapsed, It Can Be Held in Hand

MYSTERY SOLO WITH ORGAN LATEST MOVIE STUNT



Artist's Drawing, Showing Arrangement of the Amplifying Phonograph, Position of the Loud Speaker and Pitch Control on Organ Console; Dancer and Setting Are Partly Concealed behind Curtain

While the pipe organ played at the Marbro theater in Chicago recently, a beautiful voice sang and a dancer performed behind the transparent "scrim" curtain on which words of the song appeared. "We liked the number, but why didn't the singer come out where we could see her?" patrons asked the theater management. The mysterious voice was that of an electrically operated phonograph and the solo, amplified through a radio unit, was heard through a loud speaker concealed in the stage setting. The slight mechanical sounds were entirely obscured by the organ, and the illusion was so nearly perfect that several musicians in the audience were convinced the voice was that of a real singer hidden in the wings. This musical novelty can be adapted to practically any theater and enables patrons to hear the finest artists while seeing words of the songs on the scrim and enjoying tableaux, dances or other features in the soft lights behind the curtain. The only equipment needed are the phonograph with radio-amplifying unit, a microphone in place of the regular reproducer, the loud speaker and a simple control on the organ to regulate the speed of the phonograph, so that the pitch will be the same as that of the pipes. This last unit was developed to solve what at first seemed to be a difficult problem. R. Q. Dalton, radio engineer, and Albert F. Brown, organist, who devised the installation, discovered that because of changes in humidity and temperature, organ pipes do not always produce the same pitch. When the combination was first tried, there was a difference of a full tone between the organ and the hidden voice. The speed regulator was installed to correct this difficulty.

¶More than half of the plate glass used in the United States goes into the manufacture of automobiles.

The Nose Cockpit with Its Two Machine Guns, and a Full View of the Army's Flying Fort; Another Pair of Guns Can Be Seen Just Back of the Wing Radiator, and the Arrow Points to the Others

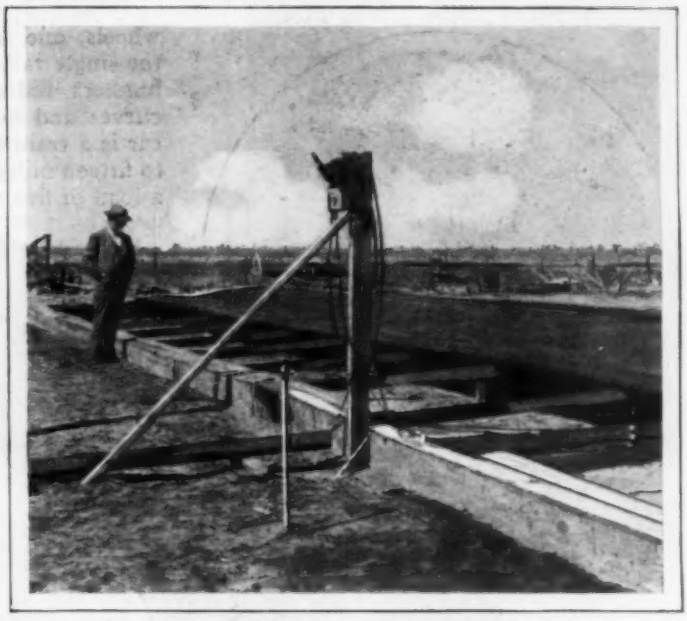
AERIAL BATTLESHIP CARRIES BOMBS AND SIX GUNS

An aerial fort, which carries six machine guns for defense and a huge load of bombs for offense, has recently been completed for the United States army. The slowness of the big bombing craft, as compared with the fast little single-seater attack planes, makes exceptional defensive armament necessary. The big plane carries three gunners, each operating a pair of machine guns, mounted side by side, so that they can be fired simultaneously. One gunner sits in the nose of the ship, another just aft of the wings, with guns pointed upward and backward, and the third is farther back in the tail, with his guns so arranged that they can fire downward and protect the craft against attack from below. The pilots sit just back of the nose cockpit, and the bomber is between the second and third gunners, with his bomb racks beneath the ship.

QUARTZ SURVEY SIGHT AIDS ACCURATE WORK

Fused quartz, which has the peculiar property of transmitting light around corners and with a minimum of absorption, is being used in an interesting way by the coast and geodetic survey to simplify the task of taking observations. In order to avoid the effects of varying temperatures during the daytime when light rays are bent or refracted, some of the most accurate measurements are made at night. A signal lamp of special design is located on a mountain peak or high tower and is so powerful that

it can be seen for more than 150 miles with the aid of a telescope. The observer, located at a distant point of vantage, makes his measurements by pointing his telescope directly at the signal lamp. This is often difficult to locate through the restricted field of the instrument and accurate pointing is sometimes hard to achieve. To simplify this, a fused-quartz sight has been devised. Two rods of the material are placed against a shielded flashlight bulb on the barrel of the telescope. One extends back toward the eyepiece and the other forward toward the objective. At the outer ends, the rods are bent at right angles so that they extend up from the telescope and the ends are pointed and lightly frosted so that they will glow. Light from the bulb travels along the rods and is seen as two glowing tips, parallel to the barrel of the telescope, and these enable the operator to line his instrument up with the distant signal. The glow of the tips can be regulated.



Electric Hotbed on California Farm; Switch Is Seen in Upper Center and Canvas Cover Is Partly Rolled Back

PLANTS IN ELECTRIC HOTBED MATURED EARLY

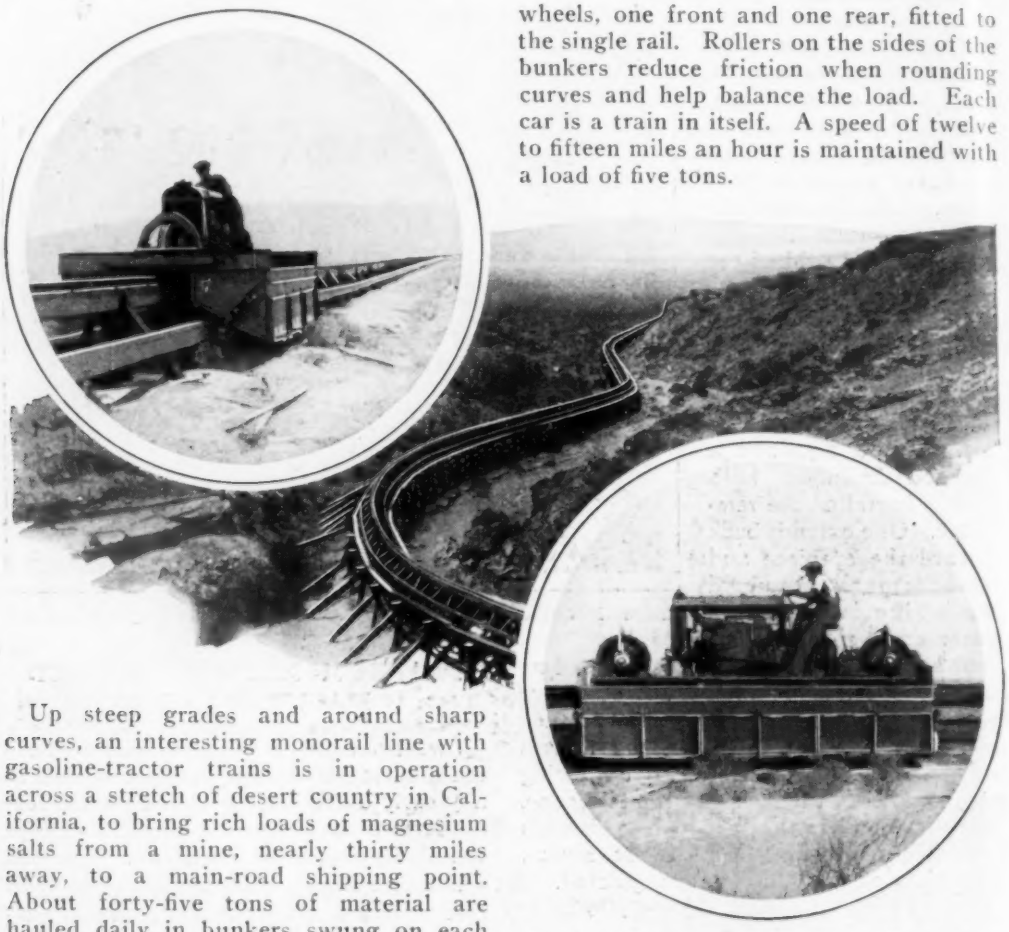
Sweet potatoes a full week ahead of the usual season and other produce at unusually early dates, were grown on a California farm with the aid of a hotbed that kept the plants warm by electricity. The bed was supplied with heat through some 4,000 feet of resistance wires, arranged in parallel strands about an inch above the surface. A heavy canvas cover was rolled over the top of the bed when the artificial heat was used. During the season when the young plants were maturing and night temperatures fell below seventy degrees or so, the current was turned on to raise the heat of the bed about fifteen degrees above that of the outside air. The early yields enabled the grower to compete with products shipped in from southern points and enjoy the high prices of the early season.

SELF-OPERATED MARCEL WAVER WON'T BURN HAIR

Women can produce their own marcel waves in a few minutes, it is claimed, with an accessory adapted for convenience and safety. It has a sliding barrel-and-lever arrangement so adjusted that it is said to produce the reverse shadow wave considered essential to a satisfactory dressing. It is made for electric operation or to be heated by gas or otherwise.

Producing Her Own Marcel Wave; the Iron Is Said Not to Burn the Hair and Has Electric Regulator

UNIQUE RAILWAY ACROSS DESERT TAPS RICH MINE



Up steep grades and around sharp curves, an interesting monorail line with gasoline-tractor trains is in operation across a stretch of desert country in California, to bring rich loads of magnesium salts from a mine, nearly thirty miles away, to a main-road shipping point. About forty-five tons of material are hauled daily in bunkers swung on each side of the tractor, which has but two wheels, one front and one rear, fitted to the single rail. Rollers on the sides of the bunkers reduce friction when rounding curves and help balance the load. Each car is a train in itself. A speed of twelve to fifteen miles an hour is maintained with a load of five tons.

Front and Side Views of the Monorail Car, Showing Bunkers That Hold the Ore, and a Winding Track

LIFE-SAVING KITE TO DROP LINE OVER WRECKS

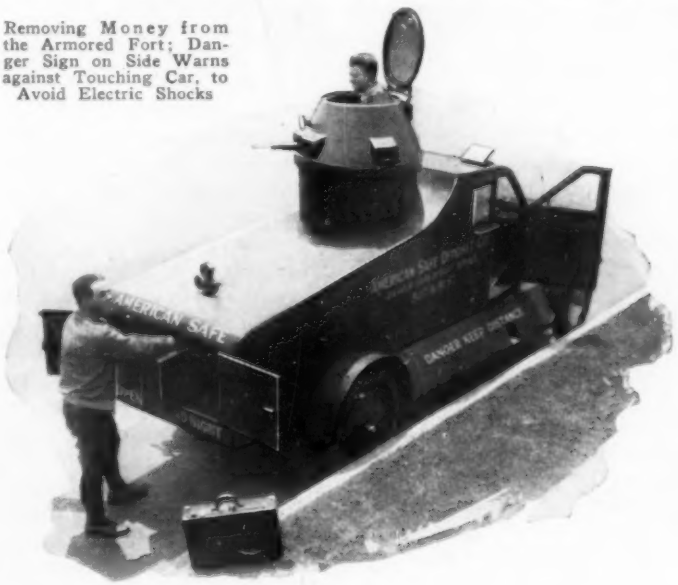
A life-saving kite, to carry a light line over a ship in distress and drop it on the deck, so that it may be used to haul a heavier line and the breeches buoy from the rescue ship, has been invented by a Florida man. The kite cord is used as a guide for a small traveler, carrying a light parachute and the rescue line. After the kite reaches the necessary height and passes over the wreck, the parachute is released, running up the kite string until it reaches a trip just below the kite, which automatically releases the parachute and allows it to drift down, carrying the line across the deck. It is only necessary for the rescue ship to maneuver up wind from the vessel in distress, so that the kite will be carried across it, and this is the normal position, as the rescue ship then breaks the waves and forms a more quiet backwater in which the sinking ship can ride. The kite device does away with carrying an expensive life-line gun and is effective over considerably longer distances. If no breeches buoy is available, the line can be used to haul an empty boat down to the wreck, a similar line from the rescue ship steadying the other end and keeping the small boat from being swamped.

PETROLEUM IS STILL FORMING SCIENTIST BELIEVES

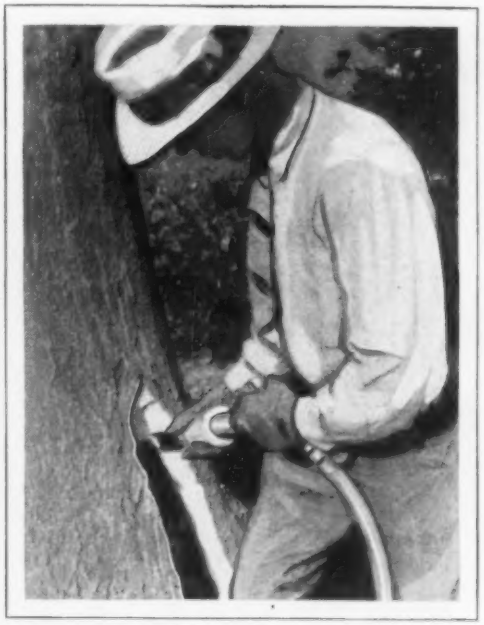
That the natural formation of petroleum is not wholly a thing of the past, but may be occurring at the present time in nature's underground laboratories, is the theory of Dr. Hans Tropsch, of the Kaiser Wilhelm institute, Germany. He bases his belief on recent discoveries in obtaining synthetic petroleum from fuels of various kinds. Coal, for instance, is liquefied and gases formed are used as a starting point for the preparation of gasoline, naphtha, lubricating oil or paraffin wax. Dr. Tropsch pointed out that in the manufacture of synthetic gasoline, no refining process of any sort is needed.

ARMORED FORT FOR PAYROLLS GIVES ELECTRIC SHOCKS

Motor "forts," the armor of which is electrically charged so that persons tampering with them will suffer severe shocks, have appeared in Los Angeles for delivering payrolls and bank shipments. In the top is a revolving turret from which a gunner commands a wide view. From his position there, the guard can throw the car out of gear and stop it at any time, and an automatic rifle is at his hand. Windows of the car are made of bullet-proof glass, and the tires are proof against punctures.



Removing Money from the Armored Fort; Danger Sign on Side Warns against Touching Car, to Avoid Electric Shocks



Using the Special Wood-Boring Bit to Clean Out Tree Cavity, Preparatory to Filling with Cork

FILL TREE CAVITIES WITH CORK TO PREVENT DECAY

Blocks of specially prepared cork are being used in a patented process of filling the cavities made in trees, to check decay. The material does not chafe the tree, contains no injurious acids or chemicals, keeps out heat and cold and permits the branches to sway in their natural manner. It also keeps out moisture and allows the bark to heal quickly. Among other aids recently introduced for the treatment of trees are woodboring bits to drill trees for reinforcing and a special unit for cleaning out tree cavities. The bits are said not to clog in green wood and may be run in the full depth and drawn out instantly.

About four feet is the average height of the pigmy people of New Guinea.

MAGIC and

Cabinet Used in a Vanishing Illusion, in Which a Girl, a Boy and a Donkey Accomplish a Seemingly Impossible Disappearance

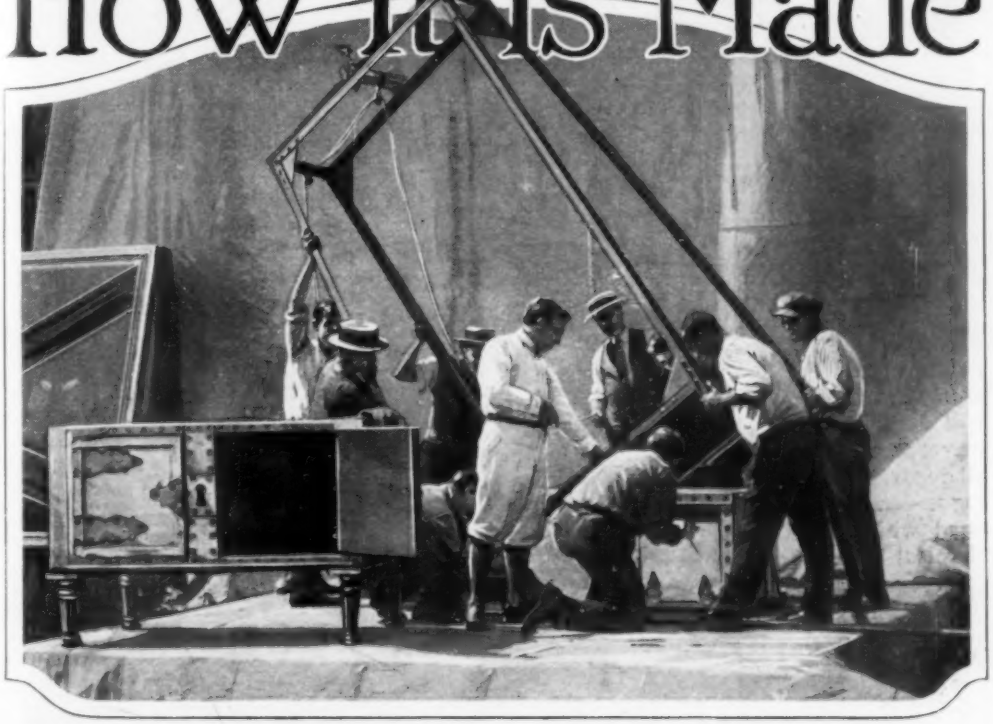
By HOWARD THURSTON

THE magician of today must be an artist. But he is more dependent upon mechanical and scientific knowledge than ever before. Years ago, he could present a creditable performance with a few pieces of apparatus, but now the public demands huge illusions and sensational effects.

As a result, the manufacture of magical apparatus has become an active industry. There are several factories in America and others in Europe, where stock tricks are turned out and special apparatus is built to order. But, for my work, I have found it necessary to establish my own factory. At Whitestone, Long Island, near my home, is a large building which was once a motion-picture studio. It has now become my workshop, and there, during the summer months, I experiment, build and test new illusions. Mechanics and carpenters are constantly at work. The cost of my "vanishing-horse" illusion was more than $5,000. The effect can be given in a few words: the disappearance of a horse from a cabinet suspended in mid-air. The method, however, required much thought and more labor. First, a large, firm platform was required, ten feet high, with an incline up which the horse could go. It had to be portable, yet strong. The illusion was finally completed and, had I been an engineer constructing a bridge, I would have known that everything would be satisfactory. But a magical illusion has to meet more than a physical test; it must deceive the minds of the people who see it. In this case, while the illusion worked, it lacked the essential snap, precision and action. I experimented and tried improvements, but everything seemed to tend toward more complicated details. So I started at the beginning again, and experimented along a new line because of the difficulty of controlling the action of the horse. The heavy platform was discarded. The horse, and the rider with it, marched into a sort of pen mounted on a platform. They were raised in mid-air. A netting and a white curtain dropped in front of the horse and rider, and as the curtain instantly was lowered, the pen fell to the stage empty, the horse and rider having disappeared. In its new form the illusion worked perfectly.

For years I have been experimenting with the "rope trick"—that fabled mystery

How It Is Made



Thurston and His Aids Working on the "Crushing a Lady" Illusion, in Which the Box, Containing Two Girls, Is Lowered into the Cabinet at Left, without Injuring a Girl Who Occupies It

of India in which a boy disappears in mid-air from the top of a magically suspended rope. The problems which confronted me seemed almost insurmountable, but they were gradually solved, and for two or three years the illusion seemed to be on the verge of completion. But every time I was ready to produce it, some complication occurred, and I was forced to delay the first presentation. I carried the apparatus with my show and rehearsed the trick on many an afternoon. I worked on it during the summer, and finally publicly presented it for the first time. While it was a success, yet I still have work to do on it. There are many details which require improvements. To the average spectator, the "vanishing horse" would seem more difficult than the Indian rope trick. On the contrary, the latter has required many more years to evolve and has cost more than twice as much money.

One of the greatest marvels of modern magic is Kellar's "levitation." The mystery of how to make a woman float in mid-air, in the center of a lighted stage, was not solved overnight. Many magicians experimented with it; and many mechanical contrivances were built, only to be discarded. Some years ago, I worked on an old form of the illusion, in which I caused the girl to whirl in the air. My mechanics worked diligently for several months, making changes, but always finding that something would not quite work.

One day I looked at the apparatus, and singled out a ring which the mechanic had spent much time in making. I told him that it was just a trifle too large and that he would have to make a new one. That was the last straw. He felt that he had reached the limit of his endurance. He quit his job and walked out. But the next day he returned, and set to work with new zeal. Within a week the illusion had been completed, and it worked perfectly.

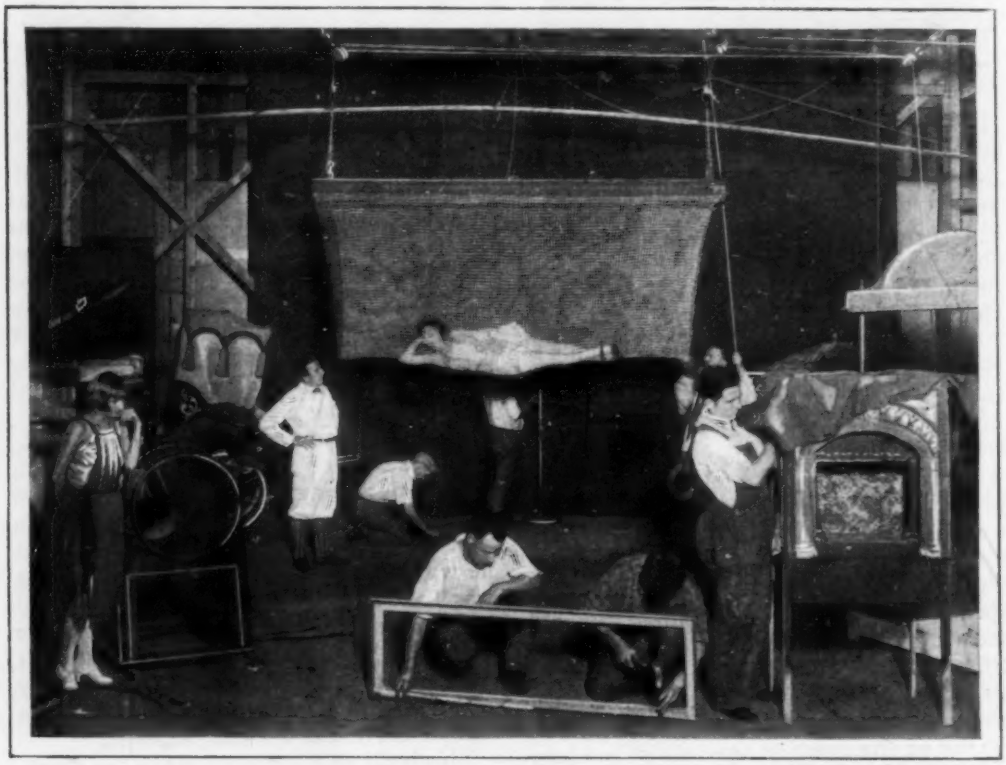
This incident illustrates one of the greatest difficulties experienced by the magi-

cian. He must have mechanical assistants, and they must be the very best. But the tasks which they are required to perform are unlike those of any other occupation. They must not only make fine contrivances that will work perfectly, but they must be able to adapt them to peculiar needs. Imagine building a phonograph that would work, yet could be taken to pieces and examined with no traces of any mechanism! Such a task would be beyond many of the most skillful mechanics, yet it would be no more difficult than some of the requirements of magical illusions.

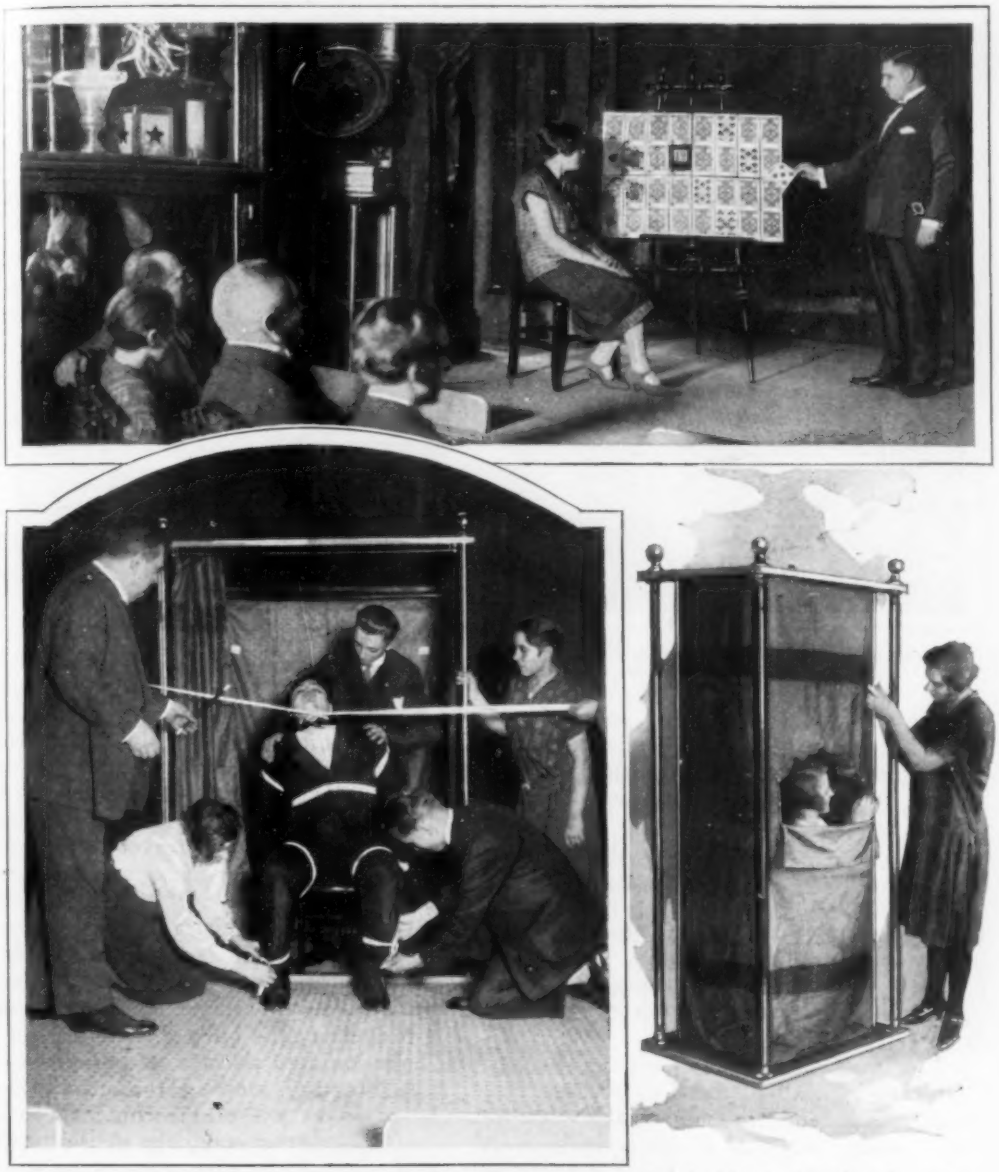
In my workshop I employ the services of expert carpenters, mechanics and painters. Every one of these men has his work to do in building apparatus that will deceive and mystify. Some of them travel as assistants with my show, because all apparatus must be kept in perfect working order and new tricks are often developed while on tour. A magician's mechanical helpers must not only be skillful, patient and persevering, they must also be reliable and trustworthy, because the element of secrecy is quite important. It has been said that "there are tricks in every trade," but magic is a trade that is nothing but tricks.

Years ago, magicians employed cumbersome apparatus and heavily draped tables that were large enough to hide anything. A reaction set in, and sleight-of-hand became popular. A magician's ability was judged according to his lack of paraphernalia. Today the public likes to see apparatus, but it cannot be clumsy or suspicious in appearance. In the building of illusions, there is also the vital factor of safety. Many persons have been injured, and some have been killed because of faulty apparatus. The levitation of a woman in mid-air; my illusion in which a live lion is employed; the raising of a horse and rider above the stage; the projection of a girl into a nest of boxes that hang from the roof of a theater; all of these are illusions which were not completed as soon as a satisfactory method had been determined for their accomplishment.

Although many illusions have cost a



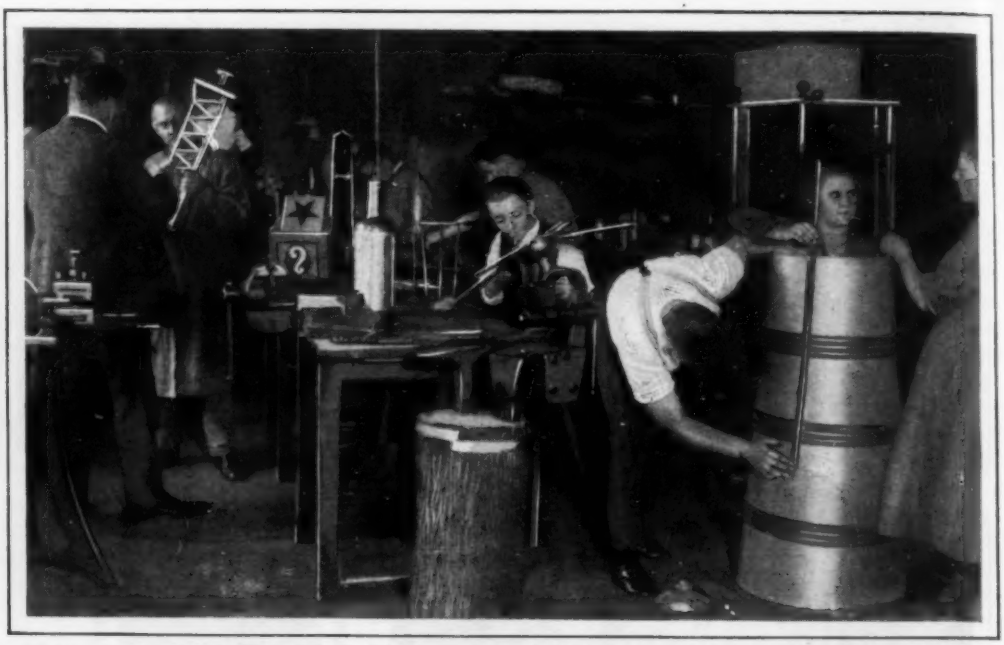
A Work Scene in Thurston's Shop; the Vanishing-Girl Illusion, Being Tested in the Background, Was Finally Developed into Another Trick, in Which a Horse Is Made to Disappear



Some Famous Magical Feats as They Appear on the Stage; the Eye Is Deceived by the Ingenious Apparatus; the Trick at the Top Is a Memory Test Performed with Giant Cards

great deal of money, expenditure does not mean success. In many lines of enterprise, results are very closely in proportion to the amount of money spent. But in magic, the situation is different, because, to the audience, a trick is a trick, or an illusion is an illusion. The fine constructive details are not appreciated. Many of the best tricks cost very little.

Nearly every art, science and material is used in the construction of magical apparatus. Vast and varied knowledge is required. It is an interesting fact that modern scientific discoveries are sometimes employed by magicians before the public has learned of their practical uses. Years ago, electricity was applied by magicians in the operation of certain appliances. Robert Houdini, who flourished seventy-five years ago, employed electro-



A Corner of the Conrad-Horster Magic Factory in Berlin, Which Produced the Houdini Milk Can, the Conrad Dollar Staircase, the Wandering Bottle, and Other Mysterious Things

magnetism in his illusions, and before radio became generally known, enterprising magicians were using the wireless telephone in connection with pseudospiritualistic tricks.

A visit to a magical factory shows that the manufacturing of conjuring apparatus is a business which presents peculiar difficulties. The place is an experimental laboratory as well as a factory, for, while a trick is in the course of manufacture, improvements or variations often suggest themselves.

"Good magical mechanics are rare," says Carl Brema, head of a magic factory in Philadelphia, "for the man who possesses the necessary skill that is needed here dislikes the peculiar work that is necessary. We have tried out less skilled workmen who understand the purpose of magical apparatus; but they spoil too many tricks.

"You can't keep a man busy on just one job, because the demand is for a variety of items. As soon as a workman is getting used to one type of metal turning, he has to leave it and start on another, which may be just the opposite to what he has been doing."

In one corner of Brema's workshop is a veritable "morgue" of discarded magical apparatus. Collapsible tables, with tops of umbrella ribs that slide down into the center leg; odd-shaped metal jars; wooden stands and battered tubes of tin are a few samples. These are the remains of magical "brain waves" that proved to be impractical. Sometimes tricks are salvaged from this junk heap, but for the greater part it consists of apparatus the purpose of which has been forgotten, and an experienced magician can look over the accumulated paraphernalia without being able to identify the bulk of it.

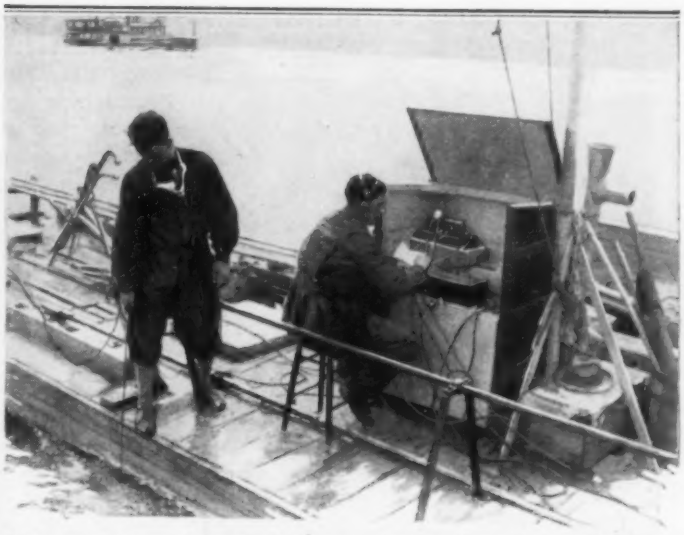
The uninitiated visitor could go through Brema's factory viewing the mechanical parts of tricks without learning a single important fact regarding the operation of any of them. The unassembled parts of tricks seem to have no definite purpose, yet each one has its use.

And so the magician of today testifies to the truth of Goethe's words in "Faust," that he who does not know the powers and properties of the elements cannot be a master over the spirits.

¶Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

COMMERCIAL AIR TRAFFIC IN U. S. INCREASING

Between 3,500 and 5,000 airplanes are now operating on commercial routes in the United States, there are twelve airways under systematic-schedule service and ten transport companies participating, reports of the department of commerce show. There was an increase of more than 100 per cent in the amount of mail carried last year as compared with the year before, and the value of aircraft and air materials was twice that for 1926, or more than $24,000,000. An outstanding feature of the development of flying is the increasing safety. In 1922, during the first operation of the air mail, there was one death for each 138,600 miles flown. By 1925, this had dropped to one fatality for each 789,110 miles, and in 1926, there was but one death for 2,292,273 miles of flights.



Taking Soundings of New York Harbor; as the Leadsman Makes His Report, His Call Is Registered on Dictaphone

CHART HARBOR BY DICTAPHONE TO INSURE ACCURACY

From daylight to dusk, three barges, lashed together and controlled by a forty-foot launch and outboard motors, make daily trips around New York's harbor, while the men on deck, members of the engineering corps of the United States army, take soundings of the water's depth. So thoroughly is this work conducted, that the charts made on the basis of the observations are said to be models of accuracy. The smallest wreck or other obstruction is noted in order to give ships a reliable guide. One of the instruments that aids in this task is a dictaphone, much like that used in business offices. As each of the six leadsmen announces his measurements, he is switched to the dictaphone so that a permanent record is made and mistakes avoided. The innovation also saves time, doing a task which formerly required three men.

HAT AND COAT RACK HAS LOCK TO PREVENT THEFT

Hat and overcoat are kept secure from theft, although not in the care of a checkroom attendant, on a lock rack recently introduced. It operates on the coin-in-the-slot principle, a nickel giving the user possession of a key with which he may unlock his belongings. The hat is held by a hinged ring that drops over a raised disk mirror and the coat by a chain passed through a sleeve. The unit is adapted to men's or women's clothing.

Locking Hat under Ring on Special Hanger

COIN-IN-THE-SLOT CURLING IRON LATEST TOILET NOVELTY

Enjoying a Home Convenience in Public, the Coin-in-Slot Electric Curling Iron in Use

Electric curling irons supplied with current for about two minutes, after a coin has been dropped in a slot, have been introduced in Germany. The iron is ready for use within thirty seconds and remains hot enough for service for four minutes.

MAIL BOXES FOR MOTORISTS SAVE LEAVING CARS

As a result of an exasperated motorist's suggestion, a special mail box, in which the occupants of cars can slip their letters or packages without stepping from the auto, will possibly be adopted throughout the country. Tired of seeking a parking place while he mailed his letters, the driver wrote to Postmaster Roy B. Nichols at Houston, Tex., recommending that a box be placed close to the curb so that it could be reached from the car. The idea was tested with an ordinary package box placed at the edge of the cement sidewalk with a ten-inch handle and a chain affixed to the drop. A "no parking" sign was painted on the pavement. Motorists soon patronized the box, as many as 800 cars stopping at it in one day, and collectors took mail from it on their way to the office, so that it received a minimum of seventeen collections daily.

STUDENT FLYERS' SPRING STICK TO INCREASE SAFETY

When amateur flyers are up with an instructor, they sometimes become "frozen" with fright and clutch the control stick rigidly so that the teacher has difficulty in getting the management of the plane. To eliminate this hazard, a spring stick has been introduced by a western aircraft company. Its chief feature is a flexible joint, so arranged that the instructor can easily maneuver his own stick even though the student is "glued" to his, thus taking control of the plane away from the pupil.

DRY-LAND SHIPYARD LAUNCHES BOATS BY MOTOR TRUCK

A motor truck plays an important part in the operation of a dry-land shipyard half a mile from San Francisco bay. Forty-foot yachts manufactured at the yard, are hoisted upon the truck, secured with chocks and hauled to the waterside where a derrick lifts them off, holds them in position for the christening ceremonies at the pier and lowers them into the water. Mast, engine and equipment are installed before the yachts are placed on the truck.

Where Motors Aid in Launching Ships; Hauling the Launch to the Water from Inland Yard

Mechanical Traffic Policeman at Street Intersection; the Arms Are Raised or Lowered Automatically with Stop-and-Go Lights, Affording Signals Visible at Greater Distance

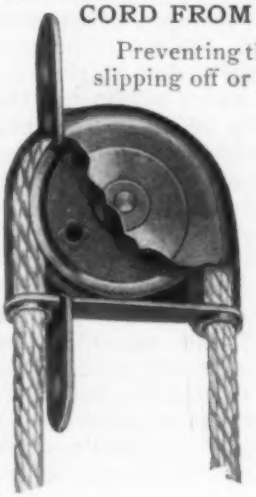
GATES TO GUIDE STREET TRAFFIC PROMOTE SAFETY

Automatic gates, somewhat like those at railroad crossings, have been devised by a Detroit inventor for street intersections, to supplement or take the place of traffic policemen. Two of the arms are up in the direction of travel while the other two remain down to denote stops. The gates may be synchronized with stop-and-go lights and operated without the need of an attendant.

SCENERY PAINTED FOR SNAKES SHOWN IN LONDON ZOO

Realistic paintings of scenes from their native haunts feature the cages occupied by reptiles in the new house at the London zoo. Crocodiles have palm-tree and lagoon decorations in their quarters, tropical snakes live in a painted jungle and gila monsters in an alkali desert with lamps that give artificial sunlight. Glass in the windows and roof admits the ultra-violet rays and special heating and ventilating equipment has been installed. If the temperature rises above eighty-three degrees, the heat is automatically shut off and, if it falls below seventy-seven, it is turned on again by thermostatic controls, and the keeper is summoned by signals.

GUARDED SASH PULLEY KEEPS CORD FROM JAMMING



Preventing the weight cord from slipping off or becoming frayed on the edges, a window-sash pulley is fitted with an inclosed guard which keeps the rope in place. It also eliminates wedging of weights between the pulley and the back of the frame, prolongs the life of the cord and presents an improved appearance.

Artificial-Sunlight Lamp with Switch That Automatically Shuts Off Current at Predetermined Time

ELECTRIC TIMER AIDS DOCTORS BY REGULATING CURRENT

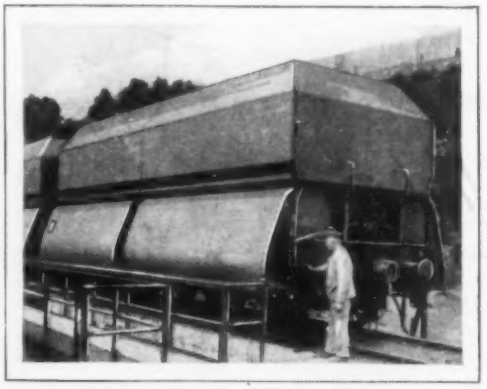
An electric timer, developed by a manufacturer of X-ray apparatus, to control the many kinds of electrical apparatus now used by doctors in treating their patients, is also finding a place in other and widely varied lines of work. It is being used to control dough-mixing machines in bakeries, to turn off photographers' arc lights automatically after a predetermined exposure, and even to regulate the electric machines used to impart permanent waves to hair. One of its features, designed to protect the doctor's patient, is proving valuable in the beauty parlors, as the subject controls a cord which will operate the switch independently of the time clock at any time the treatment becomes too warm. The clock is set with a dial, somewhat like those on a radio set, and can be regulated for any given number of minutes up to one hour. Unless the emergency cord is pulled, the clock will operate for the set time, and then open the switch and cut off the current. The timer can be stopped at any point, either by the operator or the patient, and when turned on again will automatically start at the same point and continue for the period originally set. When the emergency cord is pulled by the patient, a gong rings to summon the attendant. The clock is self-winding.

FISH CAN CHANGE THEIR COLORS WHEN SEEKING PREY

Interesting studies of fish in clear waters have been conducted by Alfred C. Weed, of the Field museum of natural history, and have revealed, among other facts, that many species have the power of changing color, some more quickly and completely than the chameleon. Pike and pickerel are among the most skillful at this, the pike, for instance, while lying in wait for prey, being able to change the color of the spots on its back and sides to look like the little specks of sunlight shining on the bottom through the ripples at the surface. Northern pike will often swim into a thick bunch of green weeds, and its spots will change to a color matching that of the growth. In the shallow waters of the Gulf of Mexico is a small fish that can make its markings almost exactly resemble the dancing light spots on the white sandy bottom, due to the sunlight shining through the ripples. This ability not only helps the fish in pursuit of prey but also protects it from larger fish.

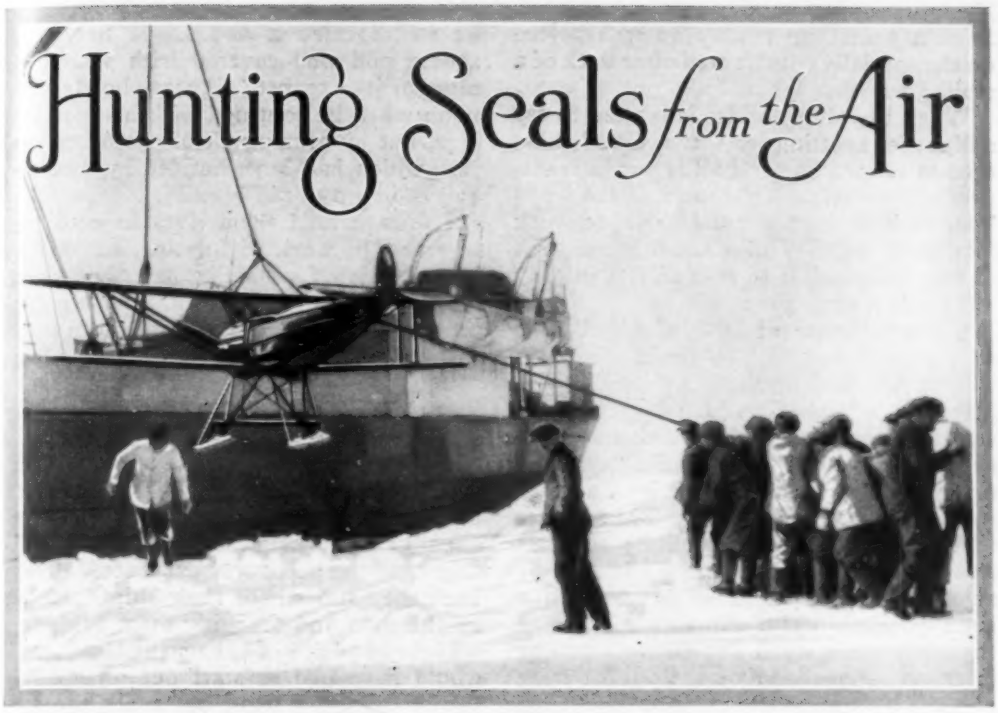
FREIGHT CAR DUMPS AT SIDE WHEN LEVER IS PULLED

For handling bulk freight, a side-emptying car has been introduced in Germany. It has a capacity of fifty tons and can be unloaded in a few seconds by pulling a system of levers operated from one end.



Freight Car, Dumped from Sides by Pulling Levers at End in Few Seconds, Holds Fifty Tons

Hunting Seals from the Air



Lowering a Ski-Fitted Plane from a Sealing Ship, to Take the Air and Scout for the Herd; the Aerial Observers Are Able to Guide the Ships to the Hunting Grounds

HUNTING seals from the air? Yes, that's the modern way. Of course this does not mean that all of the operations are carried on from the air—that would be too much of a revolution from the old-time methods that were established back in 1763. But before a seal can be captured, it must be found, and finding seals on floes of hummocky ice in a region that is swept by icy winds and blotted out by sea-blown fogs, often proves the most difficult task that the sealer has to face. He may pass within a few miles of great herds and yet not suspect their presence.

The man on lookout is called the "scunner." He clambers aloft up the shrouds to the trapdoor in the bottom of a barrel on the foretopmast. This man in the scunner's barrel is said to "take charge." And only the captain's word carries more weight than his. The progress, and often the safety and the very life, of the ship depends on his judgment. A good scunner can accomplish the impossible in worming the ship through the most dangerous obstructions. Water and ice are churned to a milky white as giant blocks leap up and disappear. The ship heels with quivering impacts, yet rides the ice down and vanquishes it. Yet all this battling may prove in vain if, by chance, the vessel is not headed in the right direction. The prosperity of St. John's, Newfoundland, and, in fact, of the whole colony, depends on the animal hunt. Failure spells misery. In the past there has been many a lean year, with its attendant suffering among the hardy islanders.

Naturally the radius of vision of the scunner perched aloft in his barrel is limited. The dazzling sun or the gray mist may mar his keenness. The ship may make but slow progress in bucking the ice and thus the field that is scanned is restricted. Here is where there is a chance for the airman to prove his worth. For him the ice floes are no obstruction. He skims along at an altitude low enough to enable him to detect a patch of seals. He usually employs a light machine that can readily be assembled and transported. It carries sufficient fuel for a two-hour flight only. It is well equipped with wheels, floats and skids, making it possi-

ble to start off ground, water, snow or ice. Such a plane can readily be transported on the specially constructed after deck of a sealing vessel.

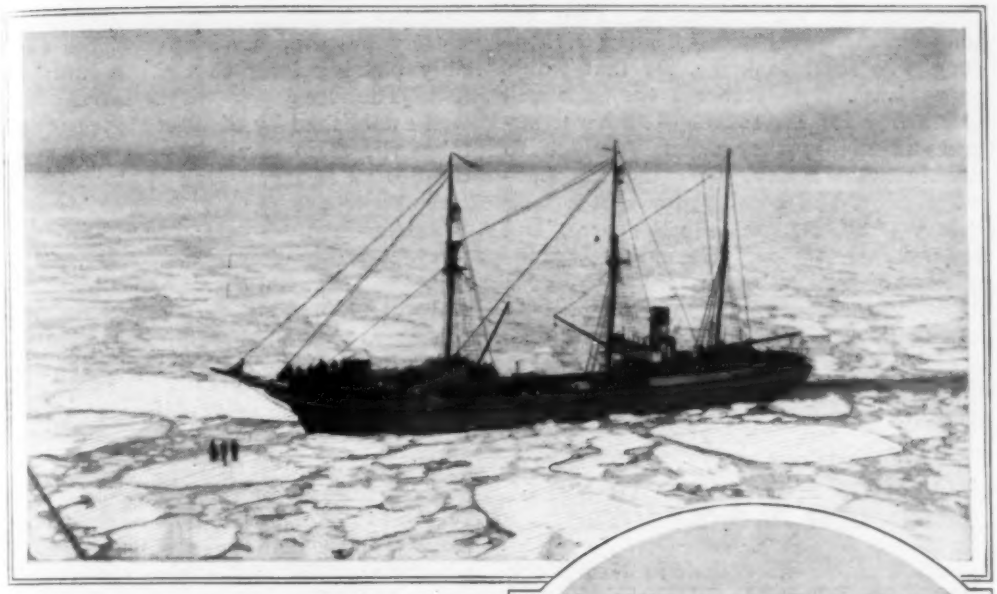
When the pilot decides it is time to try a flight for spotting seals, the plane is lowered to the ice floe and all is put in readiness for the trial. Of course, if the ice is hummocky, the crew must be set to work leveling it off. With a small plane such as this it is possible to take off if a runway 100 yards long is prepared.

The experience of C. S. Caldwell, one of the most successful flyers engaged in this service, may be cited to show how the plane helps the sealer. On March 5, the sealing fleet left St. John's with the plane aboard one of the vessels. Six days they made their way through the ice floes advancing northward slowly. Then it was that the lookout spied a solitary seal. It was decided to be merely some stray animal that had drifted far away from the main patches. The captains all agreed that they were much too far south to be in the neighborhood of seals. All were intent on continuing north. The ideal weather for flying appealed to Caldwell, and soon he was in the cockpit of his plane and away on an exploring trip. Within half an hour he was back. In his flight he had located a floe about five miles square and well covered with seals over most of its expanse. It was shortly after noon when he returned with his glad tidings, but by evening all of the other vessels, which had been notified by wireless, had come up to the vicinity.

The men held themselves in readiness to start the work of hunting, but as the legalized date for starting had not arrived, they were compelled to wait. In the meantime a howling blizzard swept down upon them, driving the vessels and the ice floes a distance of fifty miles before it had spent its fury. At the clearing of the storm, the men from the various vessels, numbering about 150 to each ship, were out with their equipment on the ice, ready for the day's work. On they went, collecting the skins in pans and marking them with the owner's flag, until the patch was exhausted. Then back they started for their ships, picking up the pans and dragging them behind.

If they had not had the plane along, they would have had to start out on a blind search for more seals, but again the airman took wing and within thirty minutes he was back with the news that not over five miles away was another large patch

The Sealing Vessel Halts alongside a Convenient Ice Floe, Lands Its Plane and the Aviator Flies Away to Locate the Vast Northward-Bound Herds of Fur Seals for the Hunters



of seals. He had noted that much rough ice intervened, but he had also determined the best course for the ship to follow in reaching this herd, and this advice was turned to good advantage.

Any innovation that can be used to lessen the perils of the sealing vessels should prove a boon to these men who risk all every season for wages that, for the whole period of several weeks, do not amount to as much as a harvest hand will receive for a week's work in the wheat fields of Kansas. Just to list these hardships would require a whole page.

Fortunately the ships in use are built of greenheart and oak, massively timbered and with iron-sheathed bows. They grind, crash and shudder through the ice. Often they blast their way through the ice packs with bombs. When they are nipped they drift with the ice, then free themselves and struggle on to take up the fight again. It has happened again and again that the ice has caught a veteran ship in its powerful pincers and nipped it like an eggshell. Shafts and propellers break. Worn-out boilers blow up. Some stray spark may touch off the sea oil and then nothing can stop the tongues of flame that roll up their deadly black smoke, strangling its victims.

If it were not for a peculiar traveling instinct of the seal family, Newfoundland might not see them. When the ice begins to form in Baffin bay, it starts the seals

At the Top, the Mother Ship Seen from the Air, and, Below, a Party of Hunters Setting Out for the Kill; They Carry Iron-Shod Poles to Stick in the Ice and Mark the Dead Seals

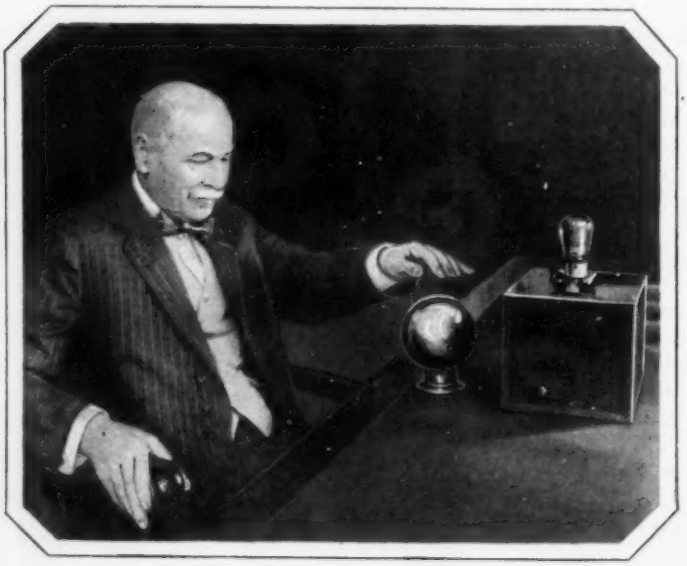
southward by the thousands. They are told by nature that they must not be caught in solid pack ice, for that would prove fatal. By October 1 they are well under way for the south. The herds migrate at night; they swim from ten to twenty miles a day, following the Labrador coast and coming down in a long string. At the same time the Greenland seals, called "hoods," are moving southward also. About December 20 the hoods turn southwest from Cape Farewell to join the Baffin bay seals, called "harps."

The harps like to cling rather close to shore to escape the heavy ice. At this stage they are lazy and like to bask in the sun, but the threatening ice follows them closely and they must keep on the move, only pausing long enough to hunt and fish. The rate at which they travel can be well established by the fact that it usually takes the main herd sixty days to cover the 840 miles from Cape Walsingham to Belle Isle.

Theirs is a strange life. Heavy ice would prove fatal to them, and yet they must have ice to suck, as they cannot drink salt water. They make great inroads on the codfish when finally they reach the Great Banks in their long migration. One authority estimates that it takes 3,000,000 codfish a day to satisfy these seals.

WAVE OF HAND STARTS MILL THROUGH RADIO CONTROL

Seated at his office desk in New York city, Judge Elbert H. Gary, chairman of the board of the United States steel corporation, passed his hand over a silver-lined glass sphere, and the wheels of a mill near Pittsburgh, 300 miles away, leaped into action. It was a demonstration of the magic power of electricity as harnessed through radio waves and a supersensitive current-controlling unit, the Knowles grid-glow tube, which can be used to release thousands of horsepower by the lift of a finger. The sphere, outwardly much like those with which the wonder workers of the fairy stories were reputed to call up spirits and perform miracles, in reality served as one plate of a condenser. Judge Gary's hand, passing over it for an instant, acted as the other plate, releasing a small electrical charge to the ground, and providing an outlet for the charge on the grid of the tube. This charge, in turn, operated a sensitive relay connected by a telegraph line with the Newark works of the Westinghouse electric company. There, the signal caused a shift in the frequency of a high-power short-wave radio transmitter that was in communication with a receiver, tuned to the same frequency, at the steel mills near Pittsburgh. This variation in frequency caused a zero or "dead spot" during which no current flowed in the receiver, thus setting a switch which started a 6,000-kilowatt motor generator driving a set of large rolls at the mill.



Judge Gary and the Magic Sphere; as His Hand Passed over the Ball, a Steel Mill, 300 Miles Away, Was Set in Operation

¶A fish known as the "star gazer" has eyes on the top of its head.

Rustic Garage Fashioned from the Hollowed Trunk of a Giant California Tree; the Front of the Second Car Can Be Dimly Seen in the Background

FALLEN TREE USED AS GARAGE FOR TWO CARS

Centuries were required to make a mountain garage in Tulare county, California. It is the hollowed-out trunk of a giant sequoia tree, which is large enough to accommodate two automobiles at a time, and serves as an efficient shelter from the weather at all times of the year.

AUTO HIGHWAY COLORED GREEN TO REDUCE GLARE

Highway engineers in Texas are planning to color new automobile roads under construction a shade of green, to eliminate the unpleasant glare from white or light-colored roads in the sun. Experiments have been conducted in order to find the most satisfactory coloring material for the work and the best shade. While the plan will probably help in driving by day, some engineers have pointed out that the green road may not be so easy to follow at night. A border line of contrasting color at the sides of the road as well as a center traffic strip have been suggested to overcome this difficulty.

ODD SHIP UNLOADS ITS CARGO ON ENDLESS BELT

To simplify the disposal of refuse in a Dutch town, a motor craft with steel conveyors in the hold, carries approximately thirty tons and can be emptied in about eight minutes. A hatch at the forward end opens for dumping the load into the sea.

Hatch at Bow of Refuse Boat Raised to Permit Dumping; a Thirty-Ton Load Can Be Dropped in Eight Minutes

Inventor with Guide That Lines Up Saw and Log Carriage for More Accurate Cuts and Saving of Timber

GUIDE FOR SAW-LOG CARRIAGE HELPS SAVE TIMBER

For his invention of a device to keep the log carriage and saw in alinement, a western lumberman was recently awarded a prize of $100. It consists chiefly of a target arrangement placed on the head block so that a line can be taken between the carriage and the saw.

SYNTHETIC STEEL AND FOOD PROMISED BY CHEMISTRY

Artificial rubber, steel and tin, and synthetic foods of various kinds, are plausible in view of recent advances in chemistry, but Dr. Frank C. Whitmore, of Northwestern university, points out that such products will probably not be made in laboratories, in any quantities at least, until price conditions demand them. As long as food can be furnished at lower costs by natural methods, there is no reason for artificial production, and he believes the same principle applies to other materials. A metal alloy, stronger than steel but only one-fourth as heavy, may come from the chemist's workshop, and steel as it is produced today is far different from that of a few years ago, due to improved processes of refining. There is a monopoly on rubber, but the price is not likely to be advanced beyond a certain point, for, if it is, the chemist will busy himself producing a substitute at lower cost. One of the outstanding accomplishments in the field of chemistry is the cheaper manufacture of helium gas. Before the war, it cost $1,500 a cubic foot, but government efforts and better ways of handling have reduced this to two and one-half cents a cubic foot.

MOTOR "LINER" OF HIGHWAYS OFFERS MANY LUXURIES

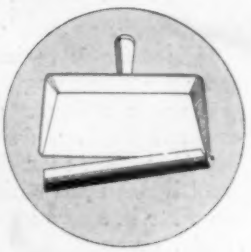
Features of the ocean liner have been adopted in a motor bus recently put in tourist service out of Los Angeles. The driver occupies a "pilot house" high above his usual position, and there is a mezzanine deck for observation. Radio, kitchen and dining facilities and lavatories are other conveniences.

Elevated Pilot House for the Driver, Kitchen and Dining Facilities Are Features of This Latest Innovation in Motor Coaches

RADIO TUBES AID POWER LINES

Developed especially for radio purposes, vacuum tubes are now employed in an entirely different field, that of power transmission. They have been adapted by engineers of the General Electric company for the operation of an instrument that indicates whether or not widely separated power-generating units are "in step," before the output of all the machines may be pooled in a common supply. Throughout the country, isolated plants are consolidating their resources in great central organizations, and before the development of the vacuum-tube synchronizing system, the "timing" of a group of generating stations was accomplished by means of potential transformers. This method was effective, but expensive. The vacuum-tube equipment provides the usual "fast," "slow" and "synchronism" indications, the potential from the lines being obtained from a special transformer and amplified until the indicating unit operates.

FLEXIBLE EDGE FOR DUSTPAN AIDS CLEAN SWEEPING



Attached without the use of tools to the dustpan, a flexible edge permits gathering up all the sweepings with a minimum of trouble. It adapts itself to irregularities in the floor surface, covers up the dents in the metal edge of the pan, and has a sharp side with no obstructions where dust can lodge.

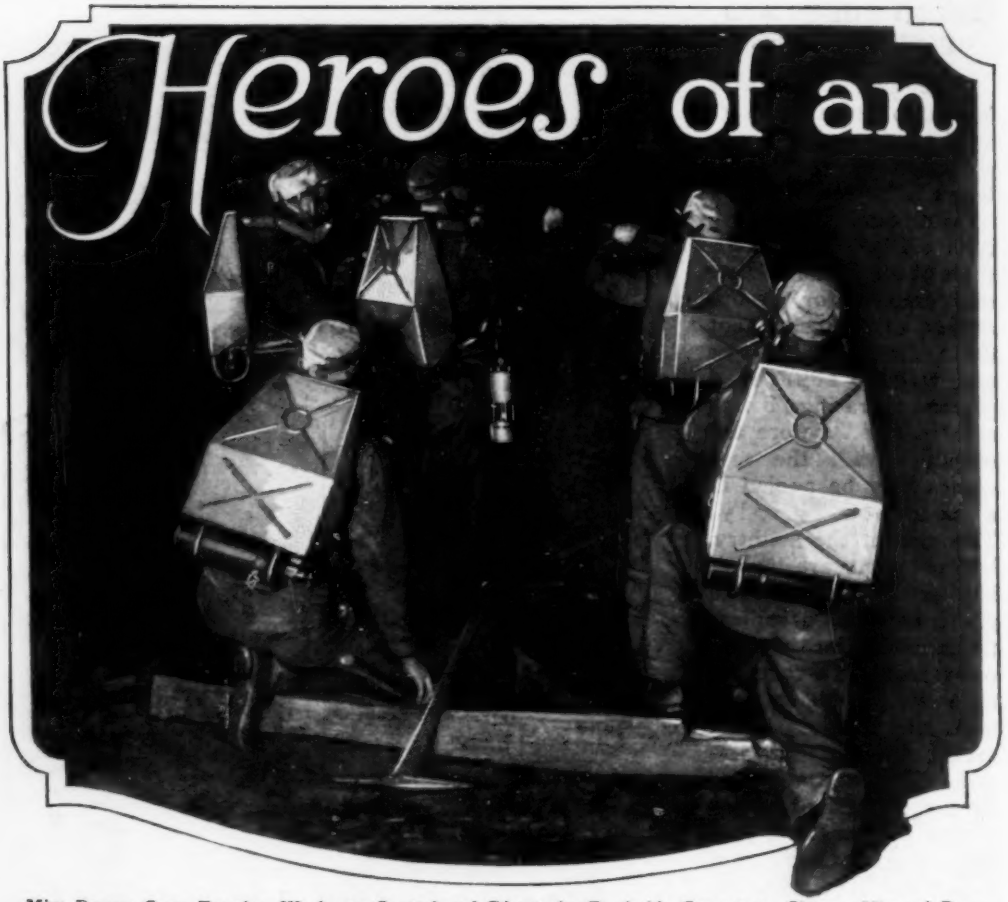
Four of the Vehicles Made from the Coaster Set; Parts Are Securely Held Together with Bolts Instead of Nails

SCOOTER, WAGON, SLED IN ONE LATEST CHILD'S VEHICLE

Six different vehicles for children can be constructed from a single assembly lately introduced for practical service as well as sport. The wagon is strong enough to haul groceries and other articles, while the sled, scooter and three-wheeled coaster offer amusement and healthful exercise. There are no nails, the parts being held together with bolts, the entire outfit occupies but little room when knocked down and, besides saving the cost of buying separate units, the rig, or parts of it, can be used the year around. The wheels are of pressed steel with roller bearings and all members are durably constructed.

¶During a drive on pests in Arizona, more than 400,000 jack rabbits, gophers and prairie dogs were killed.

Heroes of an



Mine-Rescue Crew Erecting Works to Control and Direct the Fresh-Air Current to Clear a Mine of Dangerous Gases after an Explosion; They Carry Large Oxygen Tanks on Their Backs

By M. E. CLEMENTS

THE art of saving human life has reached perhaps its highest development in the mining industry, where a million men are exposed to a greater variety of hazards than confront almost any other class of workers.

Stirred into action by a long succession of explosions and disastrous fires, the federal and state governments, mine operators and the miners themselves have striven to perfect methods for the rescue of the survivors of these tragedies.

The bureau of mines alone has trained more than 200,000 workers in first aid to the injured and has instructed approximately 50,000 miners in the use and care of oxygen-breathing apparatus, which enables the wearer to penetrate atmospheres that reek with poisonous gas and suffocating fumes. The mine-rescue courses have reduced to a definite science the whole procedure of saving life underground, from the first steps involved in sounding the alarm, summoning expert assistance, and quieting the crowds at the pit mouth, to the bringing forth of the victims.

It is difficult to imagine a type of disaster more thrillingly dramatic in its progress and consequences than a mine fire or explosion. Far down in the shadowy depths, where men delve for that mineral wealth without which the world would stagnate in a day, a match is dropped carelessly, or perhaps an electric spark goes astray. The scent of smoke or the thunderous boom of an explosion sends scores, perhaps hundreds, of men, trapped in a maze of subterranean rooms and pas-

UNDERGROUND WORLD

Using a Geophone, Which Detects Sound through the Rock, to Trace the Development of a Mine Fire

sages, groping for the avenues of escape which are only too likely to be blocked by flame, fumes or wreckage. And at the pit mouth above there gathers that mob of bewildered watchers who can only wait the marshalling of grotesquely garbed peace-time heroes, whose duty it is to penetrate the underground murk.

In many mines there are complete telephone systems which, if not put out of commission by the effects of a disaster, may be utilized in notifying scattered underground survivors of the danger, and collecting information to aid in rescue attempts. Thanks to the mine-rescue training, efficient crews of breathing-apparatus men may now be found in practically every district. The telephone and the telegraph may be utilized in summoning the rescue crews of the bureau of mines, ever ready on their ten specially equipped railway cars.

The mine official who takes charge of matters, pending the arrival of the rescue forces, sees to it that all air compressors are kept working, so that fresh air can be forced into the mine workings. Lest those underground may come in contact with electric wires and to prevent further fires and explosions from short-circuiting of wires that may have been blown down, he shuts off all electric power entering the mine, except such as may be needed for operating the ventilating fans. Blueprint copies of the mine map are made available for the rescue crews.

Rescuers Being Lowered into the Argonaut Mine in a Vain Effort to Save Entombed Miners from Death

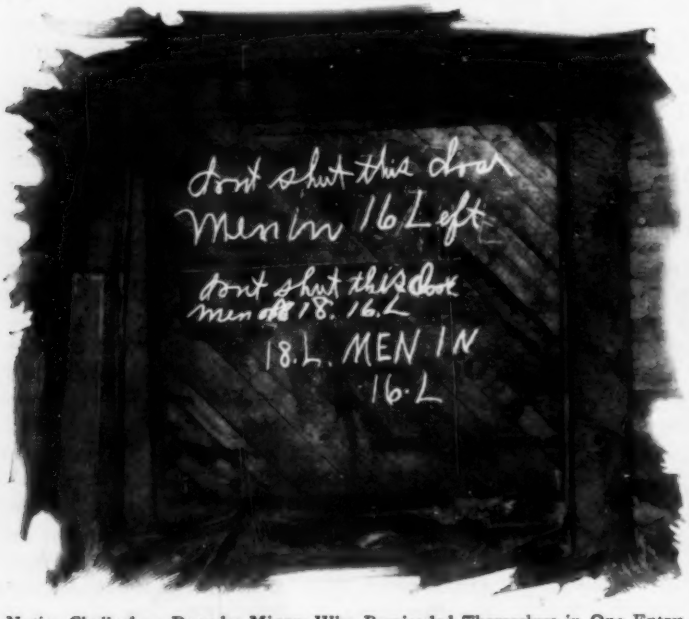
The rescue men work in crews of five, with a captain for each group. The crews are so organized that one will always be in the mine exploring in advance and a second crew held in reserve. The crews should work in shifts of four hours, two hours as advance and two hours as reserve. In addition to the rescue crews on whom the main burden of exploring the mine rests, special crews are organized for the purpose of bringing out the dead.

To complement the weird-looking oxy-

gen-breathing apparatus, which supplies breathable air to the wearer for at least two hours, the rescue crews take with them various other appliances. The carbon-monoxide self-rescuer, a canisterlike device which can be attached to the belt, will, in a pinch, furnish a half hour's supply of fresh air. The canary, carried in a cage, makes a valuable sentry to warn of the presence of the deadly carbon-monoxide gas. The mine atmosphere may be so clear that the crew will undertake its first exploratory work without putting the cumbersome oxygen-breathing apparatus into actual use, keeping the apparatus in reserve for the time when smoky and gaseous conditions are encountered. Carbon monoxide, the most treacherous of all industrial gases, gives no warning of its presence, however, and the members of the crew might penetrate unknowingly into an atmosphere where they would be overcome suddenly. Here is where the canary contributes its part to the saving of lives by being more susceptible to the effects of carbon monoxide than man. When lighter concentrations of the gas are encountered, the bird will topple from its perch, which is a signal to the crew that the gas area is being reached and that oxygen apparatus must be brought into play. The canaries are revived, after giving their warning, and are used over and over again in mine-rescue work. The hardened veterans of the rescue cars become quite fond of the birds who travel constantly with them, and have given them pet names such as "Baldy," "Goldy," etc.

Portable electric cap lamps, thoroughly tested against the danger of emitting sparks which might ignite gas, are carried by the rescue crews, as well as flame safety lamps for determining the presence of hazardous gases. A portable telephone also may be taken along. With the types of breathing apparatus now in use, a rescue crew, in the course of one shift, cannot proceed, even along a straightaway unobstructed course, for a distance of more than 2,000 feet. In parts of mines where it is necessary to crawl and to climb over debris, the distance may not exceed 300 or 400 feet. If any one member complains of feeling unwell, or is observed to stagger or breathe unnaturally, the entire crew returns to fresh air. The rescuers keep constantly in mind that the main purpose of exploring a mine with oxygen-breathing apparatus is to rescue the living. When the conditions in any section of the mine are such as to indicate that there is little probability of finding men alive, operations are shifted to other places.

It is often impossible to extinguish a mine fire by the usual fire-fighting methods, and the rescue crews are called on to seal off the fire area, allowing the fire to burn itself out, but preventing its spreading to other parts of the mine. This is effected by erecting concrete barriers or stoppings, through which are inserted metal pipes for the withdrawal of air samples from time to time for determining whether the fire still rages. Mine fires have a way of burning over extremely long periods of time. A fire in a large copper mine has burned continuously for over thirty years, causing the loss of sev-



Notice Chalked on Door by Miners Who Barricaded Themselves in One Entry to Escape Deadly Coal Gases in a Tennessee Mine Fire

Fully Equipped Mine Crew and, Below, Inspector, with Methane-Gas Detector, Which Locates the Deadly "Black Damp"

eral lives and of several million dollars in damage to property. Another mine fire, which has been burning about seventeen years, has cost several lives at various times and has tied up more than a million tons of ore. The lives of many miners, who face the horror of being entrapped underground following mine fires or explosions, could be saved by a knowledge of the proper construction of barricades behind which they might seek protection against the deadly fumes and gases that come stealing through the shadowy recesses of their subterranean prison. Barricades of this nature may be built of lumps of coal, slate, or other rock, or ore, stopping the chinks or holes with clay, rags, clothing and similar material. When a fire breaks out or an explosion takes place in a mine, the first impulse of the survivors is, of course, to dash for the nearest exit. But if the smoke and gases are too strong and are advancing on the men, they must retreat rapidly, until they come to a place favorable for barricading against their deadly pursuers. While retreating, the miners collect tools, timber, canvas, water, dinner buckets and other useful things. The site for the barricade should be near a valve in the compressed-air lines that supply the mine with air for power purposes, if air is so used. If there is no compressed air, the miners should lie down behind the barricade or sit on the floor, as thus they will breathe less of the precious air supply than if exerting themselves. Many mines now are constructed with underground refuge cham-

bers to which miners might retreat, following fires and explosions, and close themselves in until help arrives. Such chambers are provided with drinking water, canned food and compressed air.

The business of rescuing human life underground has produced its full quota of heroes—and also of martyrs. Quite a number of the bureau of mines rescuers have sacrificed their lives in the course of their careers. As the net result of their work, however, records tell of hundreds of workers saved and many millions of dollars of property preserved. The Joseph A. Holmes Safety association, numbering in its membership thousands of miners, gives annually a number of gold medals in recognition of outstanding instances of courageous and resourceful action on the part of underground workers. The annals of this association hold the stories of deeds as daring as any performed amid the flare and tumult of the battlefield.

These records tell of Louis Pahulo, who groped his way through a gas-filled drift in a Colorado metal mine, where charges of high explosives were due to cut loose at any moment, and dragged to safety a miner overcome by the gas. They tell the story of Eben W. Jones, section foreman in a Pennsylvania coal mine, who saved the lives of six miners about to be trapped by a cave-in of the mine roof, then lost his own while penetrating farther into the caving area in a desperate effort to warn other men. One page narrates the achievement of William Culp, job superintendent in a Michigan salt mine, who lowered himself in a bucket to the depth of a 550-foot shaft in an effort to save the life of an employe who had previously descended to investigate the breakdown of a pump, and from whom no word had been received, owing to the failure of the signal system. Culp made an almost superhuman, though unsuccessful, effort to rescue his fellow worker, forcing his way through an accumulation of several feet of water and an atmosphere permeated with deadly gases. After having exhausted his energies, he was unable to climb back into the shaft bucket and was drowned.

Bringing Up an Air Sample in a Sealed Glass Tube from a Burning California Mine, to Enable Expert Chemical Analysis to Be Made

Lee Fetty and John McNeil, employes of a West Virginia coal mine, were on duty underground when an explosion occurred. At the first sign of danger, they arranged a plan for rounding up twenty-two men working in their section of the mine and collecting them at the entry, where quickly constructed barricades shut out the deadly mine gases and preserved the lives of twenty of the men until the crisis was past. Two of the men, who left the barricade in an effort to escape, lost their lives.

Thomas Hislop, assistant mine foreman in a Pennsylvania anthracite operation, deliberately took the risk of losing his own life when, on the occasion of a roaring mine fire, he tore his way

Scene Following a Coal Mine Explosion at Eccles, West Virginia; the Railroad Coach in the Foreground Is a Rescue Car of the Bureau of Mines, Manned by Trained Men

through flame-filled underground passages and changed the course of the mine ventilation current, thereby saving the lives of sixty-three entombed men. Hislop was outside when the fire broke out in the timbering, about twenty feet from the mouth of the shaft. He immediately descended, and, realizing that it would be only a matter of minutes before the entire workings were filled with suffocating smoke, he battled his way through dark reeking underground passages until he reached certain mine doors which, on being thrown open, diverted the air current, causing it to carry the smoke back up the shaft and out of the mine.

One of the most notable instances of effective mine-rescue operations was that performed at a disastrous fire at North Butte, Mont., in which 163 men lost their lives. Two bureau of mines rescue cars were rushed to the scene, and during eight days of rescue and recovery work, over 175 persons wore oxygen-breathing apparatus. Many trips of 5,000 to 7,000 feet or over, in poisonous fumes, were made, and in some of these the men climbed over or around strings of ten or more ore cars, and went considerable distances in smoke and steam so dense that a sense of direction was maintained only by feeling the track rails. Working with maps, the rescuers examined every foot of the thirty miles of drifts and fifteen miles of stopes, raises and manways. Before the work was ended, thirty-one men were rescued from behind barricades, other living miners were helped to safety and 163 bodies recovered.

Approximately 3,000 men lose their lives annually in the United States as the result of accidents in mines. The tragic coal-mine fires and explosions that frequently shock the nation are generally caused by the ignition of explosive gas. The initial blast fires the accumulations of highly explosive coal dust. The system of rock dusting bituminous-coal mines is now being rapidly adopted as a means of limiting and preventing explosions. By rock dusting is meant the thorough spreading of quantities of finely pulverized stone dust in every part of the mine. When a minor or local explosion occurs, the advance air wave, always set in motion by it, will precede by a fraction of a second the onrush of the flames, and will project the rock dust into a cloud or screen, which checks and cools the exploding coal dust, holding within a very small area what otherwise would, in all probability, develop into a mine-wide disaster.

¶Trees with smooth bark are said to be less susceptible to lightning than those with thick, furrowed bark.

When Liberty's Torch was "Lighted"; the Effect of Fire Was Produced by Smoke from a Special Chemical Regulated by Mechanical Means

FLAMES FROM LIBERTY TORCH ONLY CHEMICAL SMOKE

Smoke pouring from the torch of the statue of liberty and an American flag draped from the figure's upraised arm, were features of Flag Day exercises centering about the statue on Bedloe's island. The smoke was regulated mechanically, giving the torch a realistic appearance.

AIRPLANE HOP FROM BIG LINER POINTS TO FASTER MAILS

Practicability of using airplanes to speed the delivery of ocean mails from liners was demonstrated recently, when Clarence Chamberlin successfully launched his small Fokker plane from an improvised runway on the deck of the "Leviathan" and, less than three hours later, landed at the Teterboro, N. J., air port, where he handed a mail pouch to post-office officials. It was estimated that the liner was eighty-two miles off the battery at New York, when the hop-off, the first successful one to be made from a liner at sea, was accomplished, although there was a fourteen-mile breeze blowing. Because of a fog, Chamberlin landed first at Curtiss field, before proceeding to his destination. The runway was made of planks set in front of the ship's forward funnel. The plane left the run about seventy-five feet from the starting point, rose gracefully, dipped in salute over each of three destroyers standing by and headed for New York. The aviator declared that he just as well could have carried passengers, had no trouble at any stage of the take-off and asserted that the whole plan was entirely practical. The test was made to demonstrate that planes could leave a ship before its arrival, thus cutting off several hours in the delivery time for mails from overseas.

PEA SHELLER THAT FITS ON DISH SAVES TIME AND WORK

Pea pods are quickly cut open and their contents removed with a simple unit that fits over a dish, saving time and work and sparing the fingers. The pod is placed in a grooved guide, moved along until it strikes a small blade which cuts it open, and the peas are scraped out as the pod is passed on to the other side. The sheller is made of metal and has no parts to get out of order.

One-Car Ferry for Crossing the North River in New York; It Is Steered through the Automobile's Own Steering Gear and Requires Only One Man to Operate It besides the Car Driver

FERRY FOR AUTOS IS GUIDED BY STEERING WHEEL

Autoists are made independent of larger craft in crossing the North river at New York in an individual ferry just large enough for one car. Only two men are required to operate it, and the steering is done through the car's wheel by the driver in his regular position.

OLD RAZOR BLADES SHAVE LAWN IN HOMEMADE MOWER

The question of what to do with old safety-razor blades has been solved by F. M. Durkee, of Brookline, Mass. He shaves his lawn with them. Weakened by illness and unable to push an ordinary mower, Mr. Durkee fashioned an electrically operated one of his own. The motor of an old vacuum cleaner was rigged on toy-cart wheels, connected by an axle. Shafts were mounted in holes bored in the latter and geared to the shaft of the motor with a sewing-machine belt through pulleys. Razor blades were bolted to brass disks at the bottom of the shafts. An extension lamp cord was plugged into a house socket to supply power to the motor. The machine was light and easily pushed and the cutters proved efficient in giving the lawn a close and even trim.

LETTER DUPLICATOR MAKES FOUR COPIES A SECOND

Letters are duplicated at the rate of more than four a second in an outfit a Berlin inventor has devised. Each copy is said to be free from blurs and the last ones are as legible as the first. The impressions are made from a thin metal-sheet matrix.

© Henry Miller

For Rapid Letter Copying; Impressions Are Made from a Thin Metal-Sheet Matrix and Are Free from Blurs

CODFISH ON CAR-LICENSE PLATE HONORS STATE'S INDUSTRY

How Next Year's Massachusetts Auto-License Plates Will Boost a Home Industry

Massachusetts has introduced a new style in license plates for 1928. The tags are to be marked with the figure of a codfish in recognition of one of the state's leading industries. Other states are expected to follow this idea with decorations of special significance.

RATTLESNAKES BOUGHT BY YARD TO STOCK BIG ZOO

Shopping for kangaroos, kittiwakes, emus and other specimens, to stock Chicago's zoological gardens, is easier for E. H. Bean, director, than a woman's task in selecting a new pair of shoes, for he is in touch with strange-animal markets throughout the world and has a list of professional and amateur dealers who make a specialty of rare animals for exhibition purposes. If anyone wanted an African lion, Mr. Bean could have it shipped and delivered in thirty days. If reptiles are wanted, a letter addressed to "Snake King," Brownsville, Tex., usually brings a reply signed, "rattlingly yours," with a price list of rattlesnakes at so much per yard, with a slightly higher price if the specimen is a self-feeder and need not be coaxed to eat. Sailors, tourists, foreign consuls and even missionaries are relied upon to help stock the zoo, for many of them are in the habit of collecting pets from strange countries. Some zoos have animals to trade. For instance, a director may advertise that he has an extra antelope in good condition and is willing to exchange it for a spoonbill duck. Mr. Bean has 170 park men on his lists from whom he may obtain animals at various times. According to the director, stocking the zoo is not nearly as difficult a problem as finding skillful keepers for the animals. Feeding and caring for them require special study and talent that cannot be acquired by reading, Mr. Bean says. Diet has to be varied from day to day in many instances and a thorough understanding of the animals is necessary.

CRADLE FOR TELEPHONE POLES SAVES LINEMEN WORK

Telephone poles are raised for framing with a simple unit used in connection with the cant hook or peavey, saving time and work and reducing risk. It is a malleable-steel cradle placed against the pole, which is raised upon the support with the aid of the cant hook, two rockers on the cradle simplifying the task and permitting one man to do what ordinarily takes six or more. After the pole is raised, it may be turned in the saddle of the cradle if the proper face is not in the desired position.

Pulling Telephone Pole onto Its "Cradle"; One Man Can Safely Do This with a Cant Hook

The Sport of PHEASANT TRAPPING

IN THE spring of 1912, a few pairs of Chinese ring-neck pheasants were liberated in Nebraska. Under the favorable conditions found there, these birds have so multiplied that last spring 30,000 were trapped in ten days in three central counties and shipped to other sections of the state.

The ring-neck pheasant is a hardy bird and one of the wiliest and gamest of all shooting birds. The foundation stock used in Nebraska was imported direct from England, where this species has been bred for several hundred years, but the bird is a native of China. At the same time that the pheasants were introduced into Nebraska, several other states, including Oregon, New York and South Dakota, released them within their boundaries. Hardy and adaptable though they are, they have in no place reproduced so abundantly as in Nebraska, where there is a sandy soil that dries quickly after rains and affords ideal nesting conditions.

Because of these conditions and the year-around protection, these birds have become so numerous and so tame that it is not uncommon for railroad passengers to see them stand calmly near the right of way and watch the trains go by. In fact, they became so tame that some occasionally fed with a farmer's poultry and many complaints resulted. The state was, therefore, confronted with the problem of thinning out these thrifty and hardy birds. Accordingly, plans were made to capture and release them in other sections. A trapper, who had hunted jackrabbits by night, hit upon the idea of catching the birds at night while they were blinded by the glare of auto lights. Experimenting with a crude net made from the rim of a buggy wheel, he found that his spotlight dazzled the birds and kept them in place, motionless, but the instant the light missed them they were gone. It was, therefore, necessary to approach places where the birds were likely to be roosting cautiously, and to keep the light full upon them.

When the birds had been located, the car was driven carefully to within ten or fifteen feet of them. A helper stepped out with the net and, judging the distance, carefully tossed it over as many birds as possible. It was then a simple matter to reach under the net and, capturing the pheasants, place them in a specially constructed crate. Various forms of nets were tried, but the best was made by stretching a piece of seine or light wire mesh over a light wooden hoop, about four and one-half or five feet in diameter. Burlap and heavier hoops occasionally injured birds and, being heavier to handle, were soon discarded, as were smaller nets on the ends of long handles.

Strange as it may seem, those not caught in the net the first time, if within the circle of light, did not fly, so the trapper was almost sure to get all that were roosting in one group. When the complete capture had been made, if his quota was not already filled, he could drive on in search of another group. The pheasants roost huddled together in the grass, not unlike quail. When captured, they were delivered to state officials in pairs and as quickly as possible shipped to the southern and eastern counties to be released.

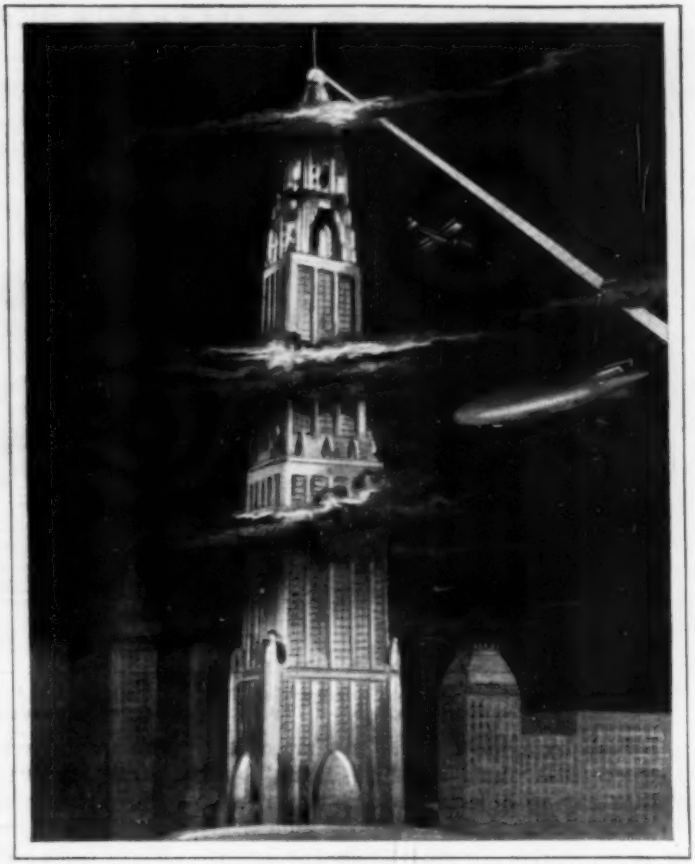
The Trapper Rides to Work on the Running Board, Dismounting to Cast His Hoop Net When Birds Are Sighted

GROWTH OF PLANTS SPEEDED BY ARTIFICIAL LIGHT

Large heads of lettuce grown in three weeks after planting the seed, wheat ready for harvest thirty-five days after sowing, and red clover in flower thirty-eight days after seeding; these suggest impractical fancies but are actual accomplishments at the Boyce Thompson institute for plant research, where exhaustive experiments have been conducted in speeding up nature by artificial means. It has been found that many plants can use much more light, heat and chemicals than they obtain by natural means. From a human standpoint, nature is enormously inefficient. Only about one per cent of the energy that falls on the plant is utilized. Three factors were essential in achieving the rapid growth: bright illumination, in some cases continued for twenty-four hours, high temperature and increased amounts of carbon dioxide in the atmosphere. The wheat and clover were subjected to arc lights at night and illumination was continued through the twenty-four hours. Tomatoes, however, needed a rest and gave the best results with twelve hours of daylight and six more of artificial sunshine. During the tests, 1,500 kilowatt-hours of electricity were used every day, indicating that commercial application of the method is not yet practical.

COAL DUST TRIED IN SHIPS TO LOWER FUEL COSTS

For a number of years, pulverized coal has been used for fuel in various industries, and now, with the ascendancy of oil, it is being investigated for marine uses, in an effort to decrease operating expenses in shipping. The 6,000-ton freighter "Mercer" has been assigned by the fuel-conservation committee of the shipping board for tests, and although definite results have not yet been announced, it is said that experiments so far have been promising. Powdered coal is explosive, and so presents a hazard when stored on a vessel, but this objection is being surmounted, it is believed, by devising a grinder that will crush the fuel just before it is burned, so that it can be kept in the bunkers in lump form. A pulverizer is said to have been fashioned that reduces the coal to a fine dust that is completely consumed and burns very much like oil, eliminating soot, dust and cinders. These results have been attained with a coal that can be delivered in bunkers for about $4 a ton, as compared with bunker oil at $11 a ton and Diesel oil at $17 a ton. Expenses of firing are said to have been reduced about fifty per cent and the radius of operation of coal-burning vessels increased about fifteen per cent. The first Diesel engine was run on coal dust, and some engineers declare that if as much experimenting had been done with the fuel in the production of high-pressure steam as for internal-combustion purposes, powdered coal and turbines would now be running a close race with the Diesel engine. On the humanitarian side, the use of pulverized coal promises the abolishment of the "black hole gang."



Drawing of Proposed Lindbergh Tower Which Would Serve as Beacon Light and Mooring Mast at Chicago Air Port

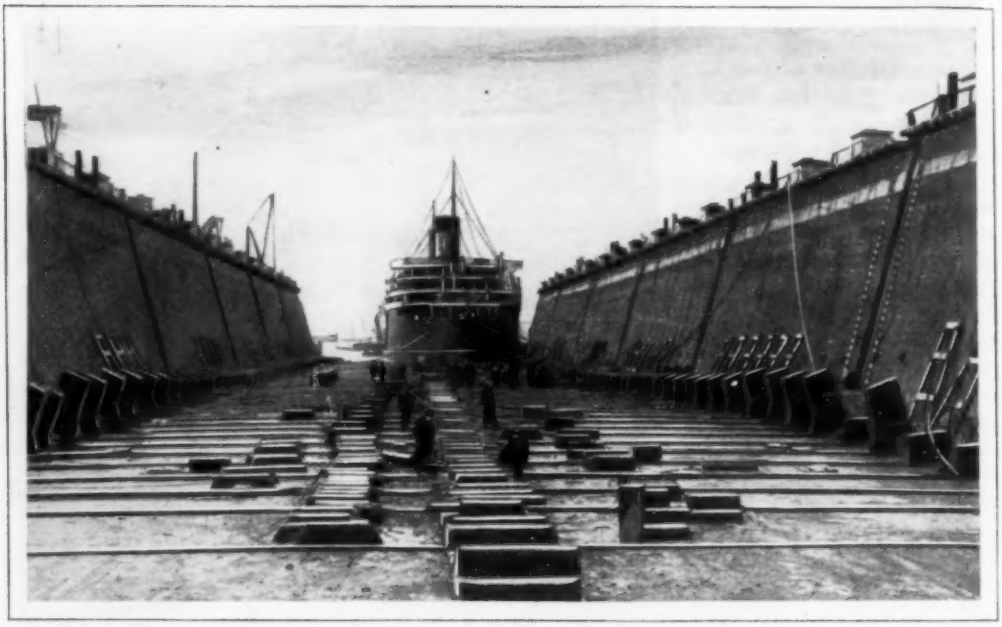
TOWER TO HONOR LINDBERGH AND ANCHOR AIRSHIPS

To serve as a beacon for aircraft and a mooring mast for dirigibles, a flood-lighted tower, 1,320 feet high, is being planned in Chicago as a tribute to Col. Charles Lindbergh. It is proposed to be erected in Grant park and serve as a permanent addition to the city's air port. The beacon at the top of the tower would be of 1,200,000,000 candlepower, visible for 300 miles.

ROLL TOP FOR AUTO PERMITS ENJOYMENT OF SCENERY

Automobiles with tops that roll back somewhat like the lids of old-fashioned desks have appeared in England. They can be shifted entirely to the rear so that occupants of the car may enjoy the scenery and the sunshine if desired.

"UNSINKABLE" LINER DEFEATS SEA ON FIRST TRIP



Docking the "Malolo," Biggest Passenger Ship Ever Built in the United States; Although the Vessel Was Rammed during a Speed Trip, Its Water-Tight Bulkheads Prevented Sinking

Struck by a blow equal to that of the torpedo that sunk the "Lusitania," and with a gaping hole in her side as large as those which sent the "Titanic" and "Empress of Ireland" to the bottom, the former after collision with an iceberg, the new American liner "Malolo" recently proved her seaworthiness by coming into port with only easily repaired damages. The "Malolo," biggest passenger ship ever built in the United States, was en route to the coast of Maine for her speed trials, carrying a party of officials and newspapermen, when, in a fog off Nantucket lightship, she was rammed by a Norwegian freighter. The bow of the freighter left a hole of more than sixty square feet, allowing the sea to pour into both boiler rooms of the big passenger ship. Within a few moments the engine rooms were flooded, yet so well were her water-tight bulkheads designed that the damage was confined to the sections actually pierced, and the weight of the inrushing water was hardly sufficient to change the vessel's normal water line. Actually five full compartments, or up to forty per cent of the entire ship, can be flooded without bringing any portion of the deck line down to the water level. The twelve water-tight bulkheads of the ship extend nineteen feet above the water line and are equipped with hydraulic connecting doors, which will either close automatically, or can be closed simultaneously from the bridge. The accident to the "Malolo" was unusual in that the freighter struck the liner exactly on the line of the bulkhead separating her two boiler rooms, with the result that both were flooded. Had the blow been five feet to either side, one boiler room would have been saved and the big ship could have reached port under her own power. As it was, she was not only helpless until wrecking tugs arrived to tow her to drydock in New York, but all auxiliary equipment, including the generators that supply electricity for the ranges in the kitchen, were shut down.

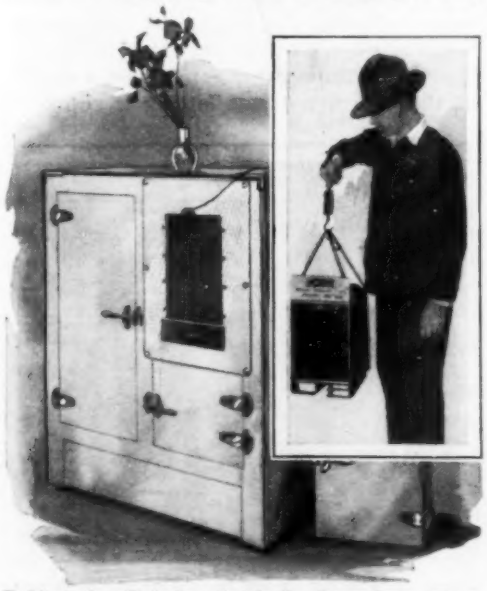
MARS WARM ENOUGH FOR LIFE LATEST TESTS DISCLOSE

Temperatures on the planet Mars are high enough to sustain life, late tests by the bureau of standards disclose, but whether life actually exists there or not is still as much of a riddle as ever. In the

summer hemisphere, under a noonday sun, temperatures of eighty degrees Fahrenheit were observed. The morning side is cooler than the afternoon side, the measurements showed. The question as to the presence of water vapor and oxygen in the atmosphere of Mars is still unanswered, but the bureau is continuing its tests. During 1926, the planet was unusually well situated for favorable observations and some of the most complete measurements were made at the observatory in Flagstaff, Ariz., with improved instruments.

ELECTRIC ICE-MAKING UNIT FITS ANY REFRIGERATOR

Simplicity of installation is the chief feature of an electrical refrigerating unit that can be placed in the old ice box and operated simply by connecting it with a lighting socket. To adjust it, the old door is unscrewed and the unit placed within the ice chamber. It is said to keep food at the proper temperature and frozen desserts solid. It also forms ice cubes in the same manner as other apparatus of this kind. In case the machine requires adjustments, "loaner" units are available from a central repair station. The portability of the outfit makes it suitable for temporary installations anywhere, the entire unit weighing less than fifty pounds.



Refrigerating Unit Installed in Ice Box; Insert Shows Its Light Weight and Compact Construction

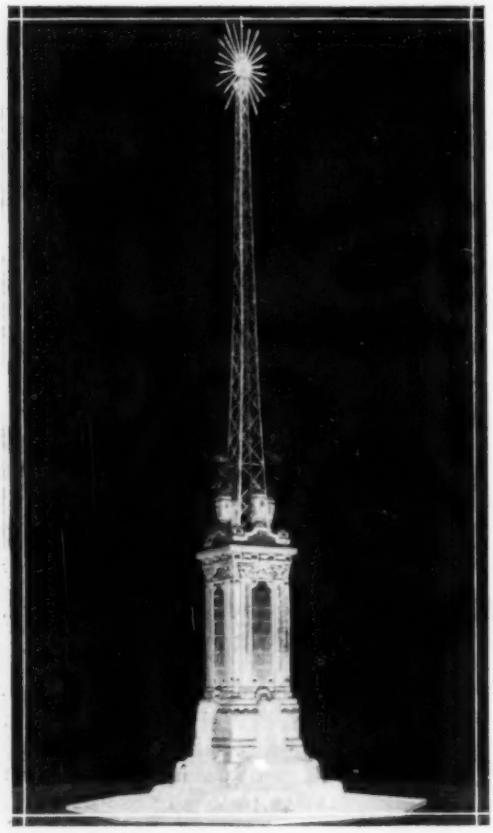
Cleaning Window with the Chemical Rag; No Soap or Water Is Used, and Glass Is Brightly Polished

CHEMICAL RAG SHINES WINDOW WITH LITTLE RUBBING

For keeping auto windshields, house windows, mirrors and other glass surfaces clean and shining, a chemically treated rag now on the market is said to save time and work. It eliminates the use of soap, ammonia and cleaning powders of all kinds, and is intended to leave a cleaner, brighter glass than is possible with ordinary methods. With the chemical cloth comes another for polishing.

PLATING PROCESS FOR RUBBER IMPROVES PRODUCTS

Rubber of greater strength, toughness and resistance to deterioration by age, can now be made by an electrical process at a lower cost than by usual methods, according to reports from an eastern company. Articles are produced in somewhat the same way as metalplating is conducted. An electric current is passed through a mixture of rubber latex, the uncoagulated milk of the rubber tree, with water, sulphur, fillers and other materials, according to the requirements of the article to be produced. The particles of rubber and other ingredients become electrically charged and are deposited on molds of the desired shape, just as copper or nickel is deposited on metal objects.



Courtesy General Electric Co.

Illuminated Tower of Jewels at Cleveland Exhibition; Music Was Played through Concealed Amplifiers

MUSICAL TOWER OF JEWELS FEATURE OF EXHIBIT

An outstanding spectacle of Cleveland's industrial exposition was a 200-foot tower, decorated with 20,000 glass jewels illuminated at night by the colored rays from thirty-six 8,000,000-candlepower searchlights. Within an ornamental cascade and concealed behind panels of fine netting were six special phonographs with amplifying equipment made by the General Electric company, so powerful that the music could be enjoyed at a distance of half a mile. Above the water basin were four large urns, from which steam, also illuminated by the changing colors of the lights, was rising. The jewels were each about two inches in diameter and were first used in the lighting effects at the Panama-Pacific exposition.

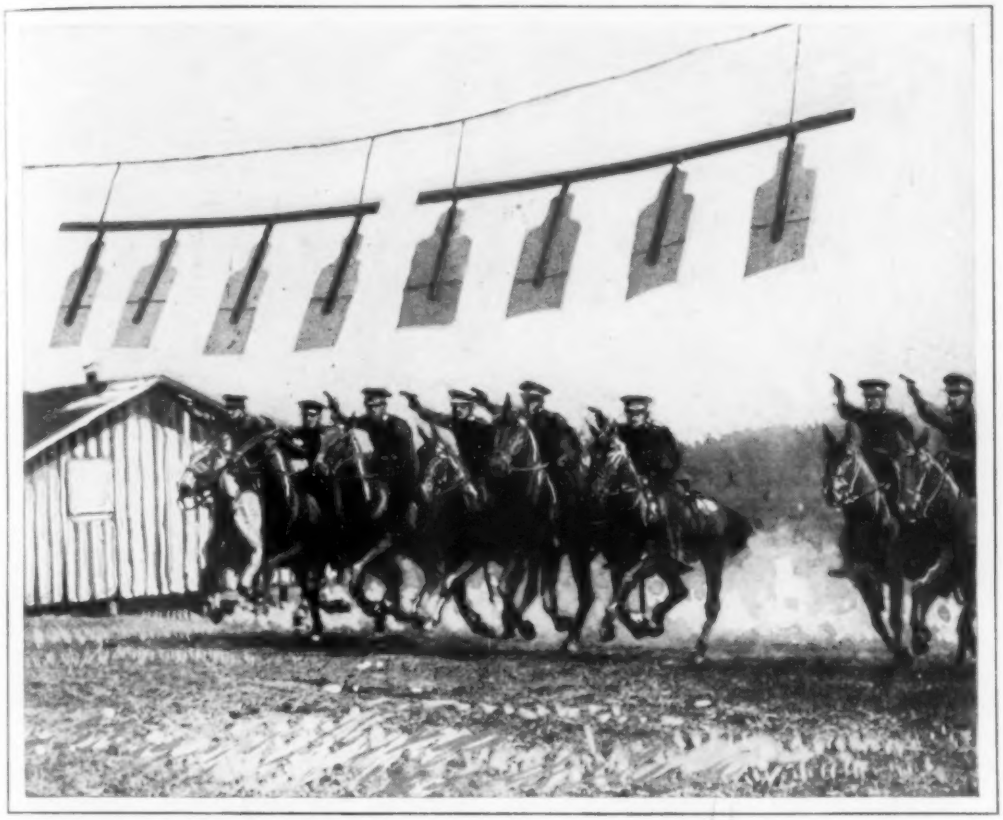
SIX-INCH BUTTERFLY TONGUES MARVEL OF INSECT WORLD

How various parts of insects and other creatures are adapted to the needs of the organism, constitutes one of the wonders of nature, aptly illustrated in the tongues of some species of moths and butterflies. Tongues of the sphinx moths may be as much as six inches long, two or three times the length of the insects' bodies. They are hollow so that the nectar may be drawn up from the blossom and, when not in use, are coiled up like the hair-springs of watches and concealed under tippets projecting on either side. In some of the butterflies and moths, the period of adult existence is so short that they never eat. Consequently, most of the mouth parts have disappeared.

MUSCLE TEST FOR CAB DRIVERS ELIMINATES UNFIT

Endurance is an essential requirement in driving a taxicab and to determine whether candidates for positions have the quality, a Chicago cab company subjects them to various physical and mental tests. One involves a strength trial for the arms. The applicant stands erect at a certain position in relation to a spring which is pushed back by the outstretched arm. A scale indicates the degree of compression and the object of the test is to determine how long the spring can be held exactly at that point without letting it slip back.

Trying to Hold the Spring Back, One of the Tests for Cab Drivers to Determine Physical Fitness



Cavalrymen at Pistol Practice; While the Principal Object of the Drill Is to Hit the Overhead Targets, the Riders Endeavor to Keep a Straight Line as They Approach

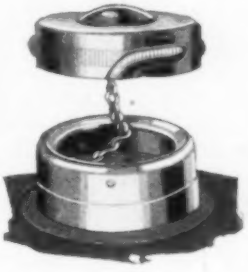
CAVALRYMEN'S PISTOL CHARGE DEVELOPS MARKSMANSHIP

Cavalry officers in the United States army are required to be skillful marksmen with the pistol as well as with the saber, and to receive the proper training under conditions as nearly like those in action as possible, target practices during charges are held. As a line dashes toward a string of overhead targets, the student officers draw their weapons and fire at a specified signal. The stunt develops quickness of eye, accuracy of aim and ease in firing from galloping horses.

MAKING MILLION PHONE CALLS REQUIRES TON OF COAL

Only a small amount of electric current is consumed in making a single phone call, but a day's messages for the entire country represent a formidable amount of power expended. One telephone company has estimated that a million calls can be handled with a consumption of 900 kilowatt-hours, approximately the amount of electrical energy that can be generated from a little more than a ton of coal in a power house.

AUTO GAS-TANK CAP HAS CHAIN TO PREVENT LOSS



In place of the usual cap for the automobile gasoline tank, a cover with a chain attached, to keep it from getting lost, is said to be secure against rattling and leaks. It can be installed on any tank by the addition of a disk spring, and only one-eighth of a turn is required to put on or remove it.

Mrs. Thomas A. Edison, Wife of the Famous Inventor, in Her Kitchen; Note the Electric Plate and the Ventilating Fan Mounted in the Window to Exhaust the Hot Air

Easy Ways to Save Work in the Home

How Uncle Sam, Inventor, Is Constantly Devising Little Things to Help Women

By RENE BACHE

QUITE a number of novel and useful inventions, designed to contribute to the comfort and happiness of women in suburban homes, in rural communities and on farms, owe their origin to the activities of Uncle Sam.

Nearly all of them represent the ideas of women. The bureau of home economics, of the department of agriculture, is run by women, whose attention is devoted largely to contriving helps for housewives. Another branch of the department, the extension service, makes a business of spreading information and worth-while suggestions along such lines.

Time was when alarm was expressed lest the government become too paternal. But today Uncle Sam is father, mother, elder brother and maiden aunt to the people. The department teaches folks how to mend broken china, take grease and ink spots out of clothes, make forms for fitting dresses, and ever so many other things, even including the proper method of setting a hen.

The extension service sends lecturers to all parts of the country. It maintains in Washington a first-class motion-picture plant, from which films are distributed, without cost to those who apply for them. Some of the films are plays, meant to be educational but with bits of comedy relief. Agents of the department, in rural regions, travel from village to village, giving movie shows in schoolhouses, the projector operated through a cable by the battery of an automobile or by a generator on the running board.

A Drop Shelf, Hinged to the Wall So It Can Be Hooked Up Out of the Way, Serves as a Kitchen Luncheon Table

Built-In Cupboard above the Sink Holds Soap and Other Accessories

Worktable on Casters and Fitted with Shelves to Carry Extra Utensils; Left, an Iron Ring with Hooks, Which Can Be Hung from the Ceiling to Hold Cooking Tools

The bureau has concerned itself most particularly with kitchen arrangements. The suburban or rural kitchen lacks not space; indeed, it is often too spacious, making unnecessary steps for the housewife. The range, the sink and the worktable should not be too far apart; the proper placing of them will save much foot travel. Also, it is important that they be neither too high nor too low.

Much travel may be saved by a judicious location of doors when a house is planned. Regard should be had for the height of the sink when it is installed. If it is set too low, the consequent necessity of stooping will be a cause of fatigue. The worktable, if too low, may be raised by setting its legs on wooden blocks; if too high, the legs can easily be shortened.

Well-Equipped Double Table and Sink Combination; an Extemporized Water Plant, at Right, and, Below, a Scrubbing Brush Which Is Made of Corn Husks, Easily Discarded and Replaced When Worn Out; the Water Tank Is Kept Filled by Means of a Force Pump

A farm kitchen may have to provide for the feeding of a dozen or more people, including hired hands, and in such a case a systematized economy of labor is particularly desirable. For such a kitchen, necessarily of good size, the bureau of home economics suggests an arrangement whereby the worktable and sink are combined in one piece of furniture, placed in the middle of the room.

The worktable half of it is inclosed, so as to provide convenient cupboards beneath. The other half

is occupied by the sink and drainboard, beneath which is a wide shelf of slats for kettles, bread pan and other large utensils. Erected on two standards from the middle of the duplex affair, is a high lengthwise shelf for odds and ends, with rows of hooks under it to serve for hanging ladles, mops, dish cloths, strainers and other small articles of culinary usefulness.

There are other ways in which the work-

Above, Ironing-Board Closet for the Back Porch in Hot Weather, with a Suitable Seat

table may be modified to advantage. Its operating surface is its top, which should be thirty-three inches high for a woman of average stature. But why not have two shelves beneath, each as long and wide as the table top? They would be very convenient for the temporary stowage of pans and other things.

Another idea, original with a woman expert in the bureau, is that of a small table hinged to the kitchen wall, with two hinged legs to support its free end. Made of suitable size—say, two and a half feet long by a foot and a half wide—it is a great convenience for occasional use. Two persons may seat themselves at it for an impromptu lunch, or it may be employed for such a culinary odd job as making biscuits. When no longer needed, it is turned up and secured by a hook.

A like expedient may be used for getting the ironing board out of the way. With its broad end hinged to the wall and its narrower end fastened with a hook, it is held flat against the wall. A hinged leg

Hinged Drop Shelf, and, Left, a Bottomless Drawer in Which Dish Cloths Are Hung on Metal Rods

provides support for the narrower end when the board is unhooked and turned down for use. As an alternative the ironing board, hinged in the way above described, may be housed in a closet, only a few inches deep, built against the wall. The wall serving as its back, the closet is a very simple piece of construction, requiring only two sides, a top piece and a door. It provides, beneath the hinged end of the board, a shallow cupboard with a couple of shelves for flatirons, etc.

A notably clever device is a bottomless drawer adjoining the sink and beneath the drainboard. Across the upper part of it, from front to back, are set half-a-dozen metal rods, on which dish cloths are hung. The drawer having no bottom, the cloths hang down below it. Thus disposed, they are always in readiness, and the housewife, seated at the sink (as she should be, on a stool of proper height, when washing dishes) has only to reach out her hand and take one when she needs it.

Another contrivance suggested, in connection with the sink, is a cupboard directly over the latter and occupying a space behind the wall. Its door is a lid that opens upward, being hinged to the upper edge of the cupboard. In it may be conveniently kept soap, washing powder and other articles pertaining to the ordinary uses of a sink. When the door is dropped down and fastened with a turn button, it is flush with the wall and entirely conceals the opening.

Most of the inventions of the bureau are of such simplicity that any person who is at all handy with tools can make the devices they represent.

LENS TELLS THE TEMPERATURE INSIDE OF FURNACES

Various metals as well as glass and ceramic materials must be closely watched while they are in a molten or melting state. There is a critical point at which they must be removed from the furnaces in order to best serve their particular purpose. In order to determine this point with greater accuracy, a telescopic instrument has been introduced. It operates on the principle that, as the temperature of incandescent bodies changes, the light from them varies. A tester places the glass where he can see through a peephole into the furnace. Inside the instrument is a tungsten filament supplied with current from a battery. The operator endeavors to match the color he sees in the furnace fire by varying the current in the filament to make it glow with the hue of the molten material. Red and green glass screens simplify this matching and also protect the tester's eyes against glare. The telescope weighs only twenty-five ounces, the battery case ten pounds and, as the outfit is readily portable and can be used in reading the highest temperatures known, it is specially adapted to severe tests. The heat can be read, while the observation is being made, by means of a meter on the battery box which is calibrated to register temperatures ranging from 1,400 degrees Fahrenheit upward.

Testing the Temperature of the Furnace by Examining Color of Flames through Special Telescope

NAIL BRUSH IN CAKE OF SOAP PREVENTS WASTE

Convenience and economy are claimed for a novel toilet accessory consisting of a nail brush around which a cake of soap is molded. When not in use, it is placed bristle-side down, so that it will be protected from the water, easier to pick up and little likely to fall into the basin or tub. With this arrangement, it is not necessary to rub the cake of soap with a brush, a process that consumes the cake faster than is needed.

WRECKING CRANE LIFTS BOAT OVER DAM SPILLWAY

When the Railroad Wrecking Crane Helped a Boat; Lifting Craft from Reservoir to Stream Below for an Emergency Trip to Pipe Lines during a Flood in Louisiana

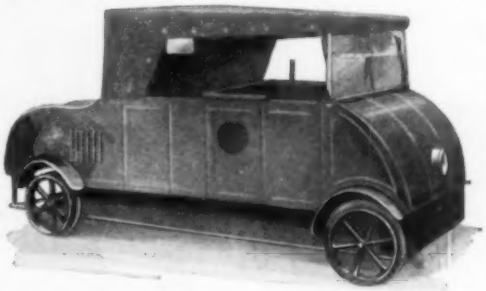
Rail and water lines met in an unusual situation near Shreveport, La., recently when a wrecking crane lifted a boat from a reservoir and lowered it over the spillway so that it could be sent down the bayou and river to make repairs in oil pipe lines which had been damaged by high water. The craft was forty-five feet long, but was easily swung into position by the powerful crane.

MIX FISH OIL IN TREE SPRAY TO HELP KILL INSECTS

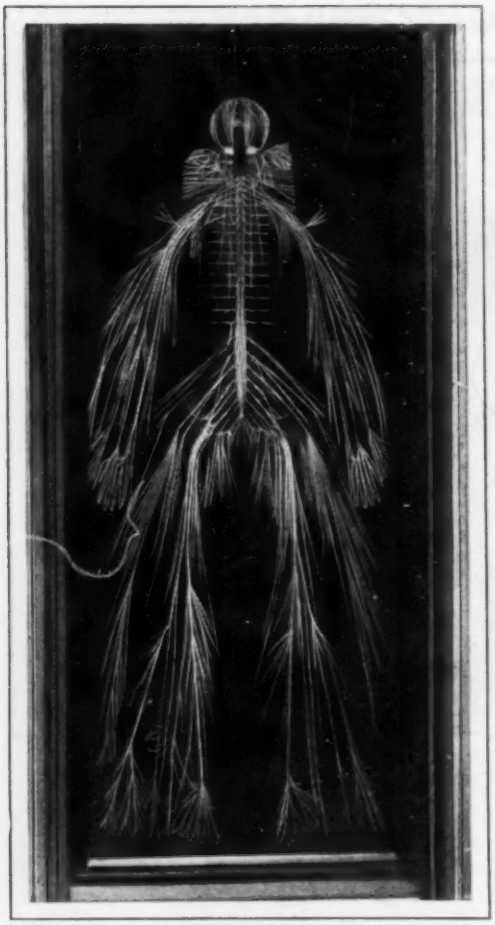
Fish oil, never noted for its fragrance, is being used by scientists of the department of agriculture in their war against insect pests that damage trees. It has been found that the substance, mixed with spray, keeps the poisonous ingredients from washing away rapidly under rain, so that the spray remains effective for a much longer time. Linseed oil has the same property, but is too expensive to use under ordinary conditions.

AUTOS FOR TRACK INSPECTIONS ALSO AID IN ACCIDENTS

So that track inspectors may cover more territory in shorter time, the German government railroads have put into operation special motor cars for their use. They are driven by ten-horsepower water-cooled engines and develop speeds as high as fifty miles an hour. Besides the ordinary equipment of tools, the autos carry first-aid outfits, and axes and other cutting apparatus so that the crew can be of assistance in wrecks.



Railroad Track-Inspection Auto on German Lines; Car Has Speed of Fifty Miles an Hour with Load



Nerves of the Human Body Represented in Model; Three Months Were Required in the Making

ENTIRE NERVE SYSTEM SHOWN BY MODEL

One of the most intricate models ever made is that of the human nervous system as outlined by an eastern physician. More than three months of intensive work were required to complete the design, which is carefully kept in a vault when it is not being used for study.

WHITE TOPS FOR AUTOMOBILES MAKE DRIVING COOLER

White tops for autos and trains would be effective in decreasing the heat on summer journeys, while a damp burlap or bed sheet, hung as a drape in the car, would add to the comfort of the passengers when the temperature is high. These and other interesting deductions have been made during ventilation tests conducted by the bureau of mines in co-operation with railroad and automobile engineers. One of the instruments used was a heat meter so delicate that it can record the warmth of a blush. It showed how white deflects heat, while black and other dark colors tend to absorb it. In the laboratory was a drum covered with water-soaked burlap and equipped with thermometers that closely registered the temperature inside and out. Fans were operated to show the humidifying and cooling effect of air motion through water. The cooling effect of evaporation alone was shown to make a difference of eight to twelve degrees in the temperature. Some railroads have installed a sprinkler system on the tops of coaches, and small ventilating fans are used inside to keep the air moving in the right direction and to help remove dust. The tests showed that an ordinary bedsheet, soaked in water and hung inside the automobile or railroad car, made the occupants more comfortable.

BRICK MOLDED IN ODD SHAPES TO SPEED LAYING

Brick for a new building in New York city have been molded into twenty-nine different shapes to speed up the task of laying. All are marked, according to form, to aid the masons in selecting the proper units for the walls.

Sample Shapes of Brick, Showing Numbers to Guide the Masons

Beauty in CONCRETE WOOD

Rustic Trellis of Concrete Logs, in Faithful Imitation of Wood; the Same Design Also Can Be Adapted for a Garden Bridge across a Small Ravine; the Chair, at Right, Is Also of Cement

By W. E. BARKER

PARK and yard furniture made of logs, bark-covered rafters, great trees curved into outdoor seats, tables of timbers roughly smoothed by hand ax and adze and covered roofs with straw thatch or shingles split from a straight-grained block of wood; all are being made of concrete, which imitates wood so accurately that words cannot convey its perfection. Even pictures fail, for they do not show the delicate shadings of color which make these imitations look like weathered wood, with bark and knots and growths of lichen so lifelike it requires the sense of touch to tell the difference.

Dionisio Rodriguez, of Mexico City, is the artist who is making concrete wood. At Breckenridge park, in San Antonio, he built a rustic bridge. Concrete logs form the footway, smaller logs make the sides and top. It looks like a log bridge built with primitive tools. The ax marks show; the growth rings can be counted on the ends of the logs; small limbs have been trimmed off, leaving chisel-shaped stubs. There are knots which growing bark has partly covered; the bark covers some logs and is partly stripped from others. Log ends have been roughly trimmed to fit against other logs and at places nails have cracked the imitation wood—nails, which, by the way, are only concrete nail heads painted a rusty brown. Closer inspection is repaid by the discovery of more clever mimicry; worm holes, a place where stripped bark exposed the channel made by some wood borer, a spot where some industrious woodpecker sought a grub. Park attendants say this bridge even fools the woodpeckers.

In the same park there is a seat carved from a curved log and covered by a straw-thatched roof, supported, like a huge toadstool, by one central log. Around this roof support there is a little table which looks for all the world as though it were built of hand-smoothed wood strips with ends mortised together. There is even a place where some idler whittled the table. He

must have had a sharp knife, for table, seat and straw thatch are all concrete.

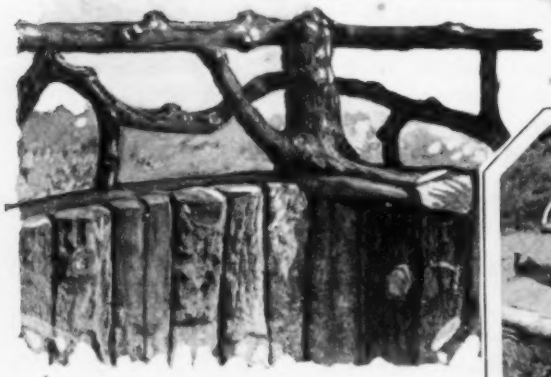
Near this shelter there is a seat built around the bole of a tree. It seems to be made of wooden strips, roughly fashioned but fitting together nicely. Because of the difficulty of bending them, the strips are short and have been pieced out with other strips. Countersunk screws hold the strips to sections of plank beneath, roughly cut in short sections to form a circle. This, too, is solid concrete. The lines which seem to mark the edges of the strips are surface lines only; the screws are dents painted a rusty brown. The seemingly uneven surface looks as though the red paint with which it was decorated had worn off in spots. But those splotches were put there exactly as they are today, when the seat was built three years ago.

Simple things are often the most difficult to imitate because there is nothing to aid deception. That is true of two benches that stand near the rustic bridge. They are so colorless, so weatherbeaten, so apparently warped old planks held up by wabbly legs, that even one who is looking for deception is surprised when a tapping knuckle discovers that they are concrete.

In Alamo Plaza, a little park in front of the ruins of the famous Alamo, there is another concrete bench and shelter. The bench is made from two stumps and a log (concrete, of course) and is covered by a perfect imitation of split shingles. There is even the sag of age in this roof.

At the entrance to the Mexican hospital grounds there is a similar bench except that it is roofed with concrete straw. At another place what seems to be an enor-

Grain of Natural Wood in Tree Seat at Left; at Right, a Concrete Arbor



Showing How Bark Is Imitated in Concrete; Note Cement Nail in Third Plank at Left; Right, Rustic Seats of Cement

mous stump has been hollowed out to make a bench. The tree of which it is supposed to have been a part was broken off some seven feet above the ground and the sloping, rough break forms the roof.

"How does he make a form to cast such things?" is the inevitable question of those who see these remarkable works. He does not cast them. Every piece of bark, every knot, every worm hole, every ax cut is fashioned by hand.

The first step is the construction of a concrete foundation to support the structure. Then a frame of reinforcing rods or iron pipes, roughly outlining the proposed finished product, is set up. Wire mesh with wires spaced from two to four inches apart each way is placed around the rods in such a manner that it outlines the concrete core of the logs. Then the space between them is filled with concrete.

The bark and surface markings are put on like stucco. Knots are built up from small pieces of brick which are stuck in the soft mortar, then skillfully covered. The tools used are nearly all homemade, though the artist now has a set of ornamental cement finishers' tools. The grain of the wood is made with a brush of straw tied together. A bundle of hay wires, with ends spread apart, makes the worm holes. The coloring is done behind a canvas screen. He uses mineral colors to which neat cement is added to make them stick. First the whole structure, if it represents wood, is painted the buff color of weathered oak denuded of bark. Then the more delicate shadings of bark, moss and other features are put on.

LION'S HEAD SPOUTS PERFUME TO ADVERTISE STORE

Women passing a perfumery store in Los Angeles may place their handkerchiefs inside a stone lion's mouth near the entrance and enjoy a fragrant scent free. A tiny spout in the mouth drips it from a hidden container.

Tiny Pipe-Organ Console Which Can Be Moved to Various Positions on the Theater Stage

ORGAN CONSOLE IS PORTABLE FOR THEATER CHANGES

Weighing but 150 pounds and easily moved to any part of the theater stage, a portable pipe-organ console has been devised by a western concert master. It is electrically controlled and is to be connected to the stationary organ for operation. Its advantages are that it may be treated as any stage property, shifted to best suit the seating arrangement of the theater, or placed so that the player need not have the audience at his back. It has a full keyboard and permits employing the entire capacity of the organ, although it is but a midget in size as compared with the usual console.

HUM OF PLANES TO LIGHT LAMPS ON LANDING FIELD

Utilization of an airplane's noise is planned in a scheme for turning on the floodlights of the airport at Hartford, Conn., by switches operated by resonance controls. As the planes approach the ground, the sound vibrations from the engines will affect the switch mechanism. According to engineers, the switches can be regulated so that they will not be actuated by vibrations from automobiles.

Mirror and Photograph in One; by Pressing a Button, the Unit Is Transformed into a Lamp

"MYSTERY MIRROR" ALSO SERVES AS TABLE LIGHT

Combined in a single decorative article for the table are a mirror, a photograph and a lamp. Reflections are seen in the glass; when a light is flashed on, a photograph is revealed and another touch on the button again transforms the mirror into a lamp. The photograph has to be treated by a special secret process before it can be used in the glass.

FISH GROWN IN DARKENED TANKS TO DEVELOP BULGING EYES

Many Japanese goldfish fanciers favor the kinds with bulging eyes, like those of a bullfrog. This characteristic is said to be developed by keeping the fish in tanks with only two small holes admitting light. The fish strain the muscles of the eye, turning and seeking the illumination, consequently acquiring the bulging effect through excessive exercise of the muscles controlling the eyes. Among 200 rare specimens recently presented to the United States by Japan in return for a gift of whitefish, were several patterned in delicate red, black, gold and silver colorings and with long, fluttering fins.

PACIFIC HIGHER THAN ATLANTIC COAST SURVEY SHOWS

By taking numerous observations along both coasts and comparing them, engineers of the coast and geodetic survey have found that the Pacific ocean is a foot higher than the Atlantic. Leveling lines were run from Sandy Hook tide gauge across the continent to the Presidio tide gauge and from another point on the south Atlantic to San Diego and San Francisco. A mean of all the levels taken along each coast was obtained and then compared, with the resulting difference of a foot. The error in running the level across the country is said to have been no more than about a tenth of a foot.

TRIANGLE GONG AS FOG SIGNAL PROTECTS FERRYBOATS

Heavy fog sometimes blankets New York harbor and menaces shipping, especially the ferryboats. To help captains find one of the piers, a triangle gong is rung so that the wharf may be located by the sound.

To Guide Ships to the Wharf; Triangle Gong Used as Fog Signal in New York Harbor

The New Billion Dollar Science

Courtesy Smithsonian Institution

One-Time World's-Record Holder, a Consetoga Wagon Which Traveled from Philadelphia to Pittsburgh in Twenty Days; an Auto Takes Less Than One Day on Modern Roads

By ARMOUR ARNDELL

TEN great highways spanning the nation from the Atlantic to the Pacific, and more than that number crossing the country from Canada to the gulf or Rio Grande, are included in the program of construction now under way in the United States.

The new science of road building has progressed in direct proportion to the development of the American automobile. Not only has the nation expended $10,000,000,000 for roads in the past decade, but it contemplates the additional outlay of more than $14,000,000,000 before the close of 1937. Thus the twenty-year expenditure for highways of the United States will have surpassed the total war debt of the nation. Who builds the mammoth system, and how is it constructed?

The annual construction of approximately 50,000 miles of modern roads is not carried out in a haphazard manner. The exact need of every mile of thoroughfare is scientifically studied to determine the type of surface that is essential for the efficient and economical handling of traffic. The actual building is then carried on under the supervision of carefully schooled scientists or highway engineers.

The modern highway engineer traces his ancestry back to the days of the mighty old king, Sennacherib, who ordered the first city street built through the market places of his royal city, the historic old Nineveh. The Babylonians carefully laid their roads to handle the traffic demands of charioteers, war equipment and equestrians; and later the Romans, inspired by the military advantages accruing from an efficient system of highway transportation, built great stone roads into all corners of their empire. Among them was the famous Appian Way, in many places more than four feet in thickness and built of solid rock by military and slave labor.

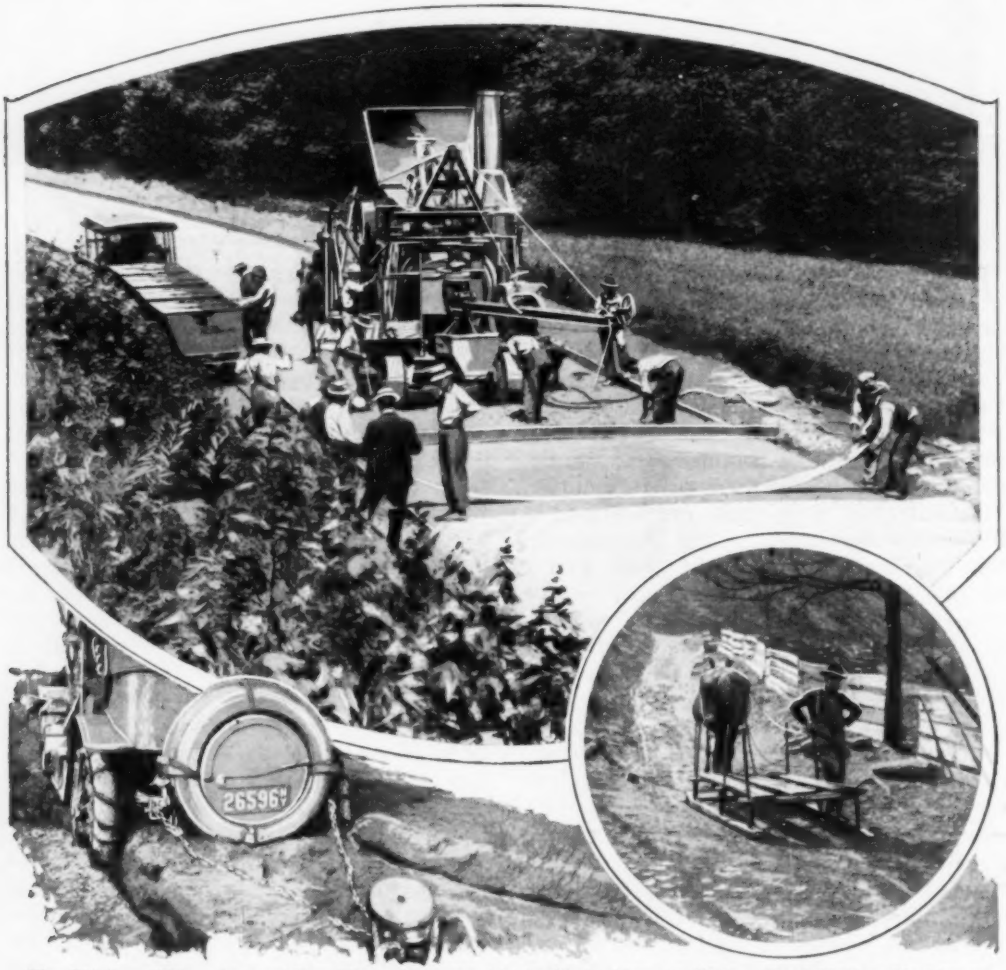
From these early days of chariots, light vehicles of war and horsemen developed an even more elaborate system under the great Napoleon, who, sensing the necessity of a transportation system to the integrity of his domains, caused his country to be crisscrossed with the first scientifically constructed roads in the history of civilization.

The present era has offered the most intricate problem of all time. Twenty-two million motor cars are roaring over the public highways. They demand smooth

and dependable surfaces for safe and economical operation. The meeting of that demand has developed a new science which is not only confronted with the gigantic task of expending more than $1,000,000,000 per year, but shoulders the responsibility for the well-being of one of the nation's greatest assets—highway transportation. Today the construction of a single piece of road involves as much study as a surgical operation or the pleading of a complex case in law.

The most recent development is the traffic-census system for determining the type of road best adapted to a particular thoroughfare. The weights and designs of all vehicles passing over a thoroughfare are carefully tabulated over various periods of the year and hours of the day. The results are analyzed and, through previous experiences, it is possible to determine exactly the design and materials essential for the construction of the most efficient and economical road that can be laid. On the primary system, better known as the National Federal Aid system because of the government's participation in its construction, the roads are constructed under specifications approved by the United States bureau of public roads. This system includes 182,000 miles of the most widely traveled highways in the country, and particularly the interstate and the transcontinental routes.

When road specifications have been approved by the bureau, the various states



The Old Days When Automobiling Was a Contest with the Mud; Above, a Modern Road-Making Machine at Work in North Carolina, and, in Circle, the Kind of Road It Is Replacing

Fifth Avenue, New York, during the Easter Parade in 1900, When the Automobile Was Still an Experimental Toy and the Hansom Cab Hadn't Given Way to Fleets of Taxi Cabs

are permitted to carry out the proposed construction, with the federal government bearing a reasonable portion of the expense, never exceeding fifty per cent. The fifty-per-cent rule is waived only in the case of a few public-land states, where a large acreage is still under control of the national government. The Federal Aid system costs the government approximately $90,000,000 each year.

The actual laying of our road system is accomplished by a large number of trained engineers, in most cases college graduates in highway-engineering courses. A knowledge of surveying, highway location and economics, reaction of materials to various temperature and weather conditions, traffic stresses and tensions, and many other fundamentals are essential before an engineer is ready to be entrusted with the important task of directing the construction of a modern highway.

One of the most amazing developments in connection with the growth of our gigantic system of highways has been the building of highway-construction equipment. Enormous machines, some of them capable of laying 2,000 feet of concrete road in a single day, have grown out of the crude equipment in use a few years ago. The annual road-machinery exposition held each year by the American Road Builders' association has more than 300 carloads of this equipment on display, and each exposition brings to light new developments that increase the efficiency and economy of highway construction.

Who pays the $1,250,000,000 annual sum for modern roads, and is this expenditure justified?

Approximately fifty per cent of the total is expended by the various state governments, $90,000,000 annually by the federal government, and the remainder by county, municipal, township and private agencies. The state funds are raised principally through the mediums of gasoline taxes, motor-vehicle licenses and direct taxation

of property. In 1926, gasoline taxes yielded the states revenue to the amount of $187,603,231, with the tax ranging from one cent to five cents per gallon, and averaging 2.38 cents per gallon. During the previous year, automobile-license fees contributed $260,619,000 to the various state treasuries. Thus it may be seen that the motorist, after all, rather than the individual property owner, pays for the highways which make it possible for him to operate his motor vehicle with speed, economy and safety.

The payment of gasoline taxes in 1926 has made it possible to determine the fact that motor vehicles consumed approximately 10,000,000,000 gallons of gasoline. At an average of twelve miles to the gallon, these cars traveled the astonishing distance of 120,000,000,000 miles in a single year. At this rate, the road system is costing the nation but one cent per vehicle-mile, and since research has proved these roads save from two to ten cents per mile, the conclusion that they are saving many times their cost is obvious.

The development of America's system of individual transportation has been phenomenal. Where, a few years ago, mud and dust prevailed according to the varying conditions of the weather, today we find a smooth hard highway stretching into any part of the nation. The first transcontinental highway in the history of our country will soon be completed. It is 3,400 miles in length, extending from New York city to San Diego, Calif., via Washington, St. Louis, Texarkana and El Paso, and is already ninety-eight per cent completed. A second great highway, partially completed, is international in nature and extends from Montreal in Canada, through the United States to a point approximately fifty miles south and west of Mexico City.

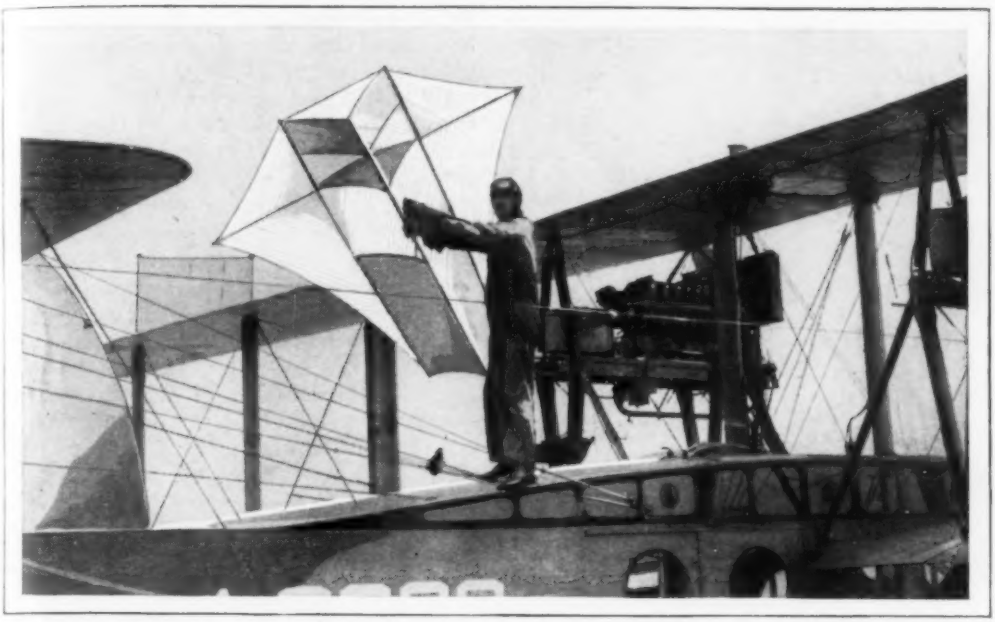
In fine, the American highway is an achievement that is making history. It is welding an already great nation into a nation of greater internal integrity.

TEST AIR SAMPLES FOR DIRT TO GUARD PUBLIC HEALTH

How much dust and other foreign material are in the air we breathe? At what time of year is the amount likely to be greatest, and how can the hazards of impure air be reduced? These and other questions are being answered by the United States public-health service and other bodies on the basis of facts obtained by testing samples of air from different localities. Carefully measured quantities are taken and subjected to various tests by which the examiners can compute, with a fair degree of accuracy, the amount of dirt in the air and detect the presence of harmful gases, disease germs and other bodies. In making such a survey in Boston, recently, an outfit mounted on a motor truck was used, saving considerable time and promoting accuracy, as the air could be tested at the spot where it was taken and under a wide variety of conditions.

Gathering Samples of Air for the Pollution Tests; Portable Outfit in Boston, Where Extensive Survey Was Made Recently

¶German chemists are reported to have discovered a process for making synthetic tobacco.



One of the Types of Kites Being Used on Naval Planes to Support Radio Antenna in Case of an Emergency; Besides This Service, the Kite May Be Used as a Visible Signal of Distress

KITES TO HOIST RADIO ANTENNA AID IN AIRPLANE LANDINGS

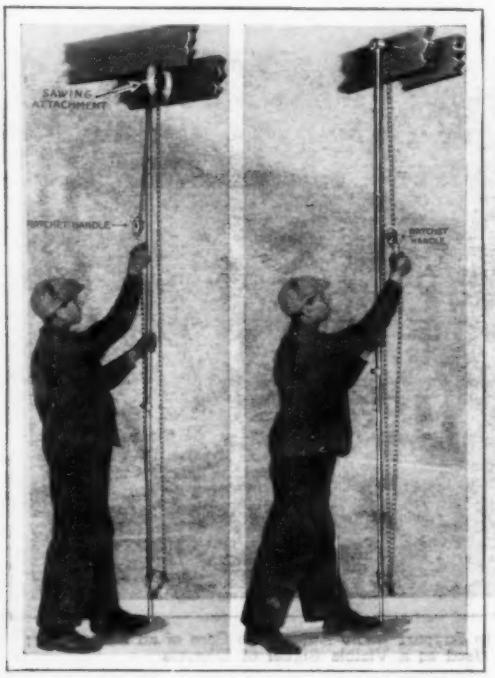
Kites are proving helpful to aviation as a means of raising radio antenna in case a plane has made a forced landing and emergency communication is necessary. So successful have the kites been performing in naval tests that they may become part of the standard equipment of navy planes on long flights. The antenna wire takes the place of the kite string. Engineers are working on a four-foot kite which is expected to be powerful enough to carry 500 feet of aerial wire and which would also serve as a visible signal of distress. A five-foot man-carrying type of kite, tested at the Anacostia naval station, proved that it could be successfully flown from a plane forced down at sea.

CARING FOR YOUR WATCH

During a sudden cold snap, a watch should not be wound until it has been warmed for at least fifteen minutes. To wind it immediately after exposure to cold may break the spring. During the night, the watch will run better if it is in about the same position it occupies during the day. The timepiece should be wound in the morning instead of at night. It is directly after winding that a watch works best and can thus stand the vibrations during the day. It should be wound slowly, carefully avoiding jerks. Count the number of turns the spring will allow without undue strain. These hints were recently given by a large watch manufacturer as practical ways to improve the performance of the timekeeper and prolong its life.

KNIFE TO CUT AUTO PATCHES IS ATTACHED TO CAN

Among recent accessories for the motorist is an improved tire-patching material, a special fabric imbedded between two layers of rubber. A feature of the outfit is a beveling knife attached to the cover of the container in which the patches are kept. It is said to cut a fine feather edge, which is necessary to insure the most satisfactory repair.



Chain Rig for Sawing and Boring; It Saves Bother with a Ladder and Permits Easy Working Position

BORING MACHINE FOR CEILINGS HAS SAW ATTACHMENT

Designed especially for electricians, plumbers and steam fitters, a boring unit for making holes in ceilings or other elevated areas, is operated by a chain and ratchet handle, permitting the user to maintain a comfortable standing position and saving work. The unit is quickly converted into a saw by screwing a circular blade upon the chuck of the machine.

PREDICTING ECLIPSES

As early as 2800 B. C., Chinese astronomers were predicting the coming of eclipses and were receiving rich rewards for their services, but if they made mistakes, their heads were chopped off. The phenomena were attributed to dragons, living in opposite points in the sky, that completely or partly swallowed the sun or moon. The Chinese observers had found that a "swallowing" was almost certain to occur after so many days, so their predictions came true after a roughly calculated rule, although they were bound to be inaccurate and estimates could be made only for that part of the world. Today, astronomers can foretell eclipses to the second for any part of the globe and can say how long they will last and whether they will be complete or partial, for it is now known that they are due to relative positions of the sun, moon and earth and resulting shadows. There cannot be more than three eclipses of the moon in one year and in some years it is possible for the moon to miss the earth's shadow. In regard to the sun, it cannot undergo more than five eclipses in one year and it is impossible to go a whole year without at least two being visible at some place on the earth.

SMOKESTACK BIG AS TUNNEL HOLDS AUTO TRUCK

The size of the smokestacks for the liner "City of Honolulu," being built at a Los Angeles shipyard, was demonstrated recently when an automobile truck was driven into one of the funnels. There was room to spare. The vessel will be equipped with two of the huge stacks.

Almost Big Enough to Serve as a Garage; One of the Huge Funnels for the Liner "City of Honolulu," Built in Los Angeles

Uncle Sam's CHICKEN FARM

Every Chick Born in the Government Poultry Pens Gets a Wing Band That Identifies It for Life, So That Its History May Be Entered in the Books for Future Comparisons

ON a sixty-acre chicken ranch a dozen miles outside Washington, at Beltsville, Md., the United States government is conducting the world's largest experiment in scientific chicken raising, and every day is learning lessons which can be applied by the thousands of poultry raisers throughout the land.

With from 4,000 to 4,500 fowls, of twelve different breeds, to experiment with, the government scientists are learning things that will improve the egg-laying qualities or the meat value of the nation's 410,060,000 chickens. That is the estimated poultry army, according to the bureau of census—a flock that would provide three fowls for every man, woman and child, with 30,000,000 left over. The hens among them lay approximately 1,654,044,932 dozen eggs each year, and still another three million odd dozen have to be imported from abroad to meet the egg demand.

Half the sailors at sea, it has often been estimated, have an ambition to retire some day and settle on a poultry farm, and thousands of city dwellers, clerks, stenographers and others, hold the same desire, so poultry raising is one of the country's leading farm pursuits. To supply all the chicken raisers, present and prospective, with adequate scientific information, the corps of the department of agriculture experts at Beltsville are studying the questions of feeding, housing, breeding and raising chickens, as well as how to get more eggs, better eggs, thicker-shelled eggs which will withstand the rigors of transportation, and how to fight the diseases of poultrydom.

Last year alone twenty-seven pens, containing 500 chickens, were used in the scientific study of chicken diet; 1,200 hens and pullets were trap-nested to count their egg yield, and the rest of the experimental flock was used in other studies.

In the government flock there are white Leghorns, Rhode Island reds, barred Plymouth rocks, white Plymouth rocks, buff, partridge and silver rocks, brown Leghorns, Anconas, silver Campines, rose comb, white and black bantams. Eight long poultry houses are set aside for laying hens, while breeding pens, made portable so that they can be dragged to new

Bringing Off the Incubator Hatch, with Baby Chicks Just Emerging from the Shells; Thousands of Fowls Are Raised and Studied Each Year by the Government Poultry Experts

ranges frequently, are set aside for the breeding stock.

With twenty-seven pens for last year's food tests, each group was given a different sort of food and the results carefully tabulated. Fish meal, tankage, gluten meal, kafir and other foods were tried in various combinations, along with the more familiar articles of diet. All of the results of tests in each line of work are later embodied in the department's poultry pamphlets, and sold for a nickel or a dime through the government's superintendent of documents.

In one test to discover the effect of limestone on eggshells, eleven pens, each containing thirteen pullets, were fed varying amounts of the powdered stone, ranging from none at all in one pen up to twelve per cent in another. The pullets who got no limestone showed a fifty-per-cent drop in egg production, but none of the experiments indicated that limestone caused any appreciable change in the shell texture. The same results were obtained by using gypsum grit. Limestone grit gave fair production, about the same as a two-per-cent limestone diet. Egg production was practically the same in the four to eight-per-cent limestone pens, but dropped off in the pen of those getting twelve per cent stone, just as it did in the pen where no stone was fed.

Tests with varying amounts of protein established that growing chicks made their maximum gains on a seventeen and a half per cent protein diet. When more was added, the effect was much the same as feeding less than the required amount. Cod-liver oil was used in most of the protein diets, and when it was omitted, there was quite an increase in the number of chickens dying, and much poorer growth among those that lived.

The tests showed that proteins were an absolute necessity. There are both meat and vegetable proteins, and the former were found to be particularly necessary for a poultry farm whose chief reliance is on egg production. Vegetable proteins, such as cottonseed and soy-bean meal may be profitably used when combined with meat scrap.

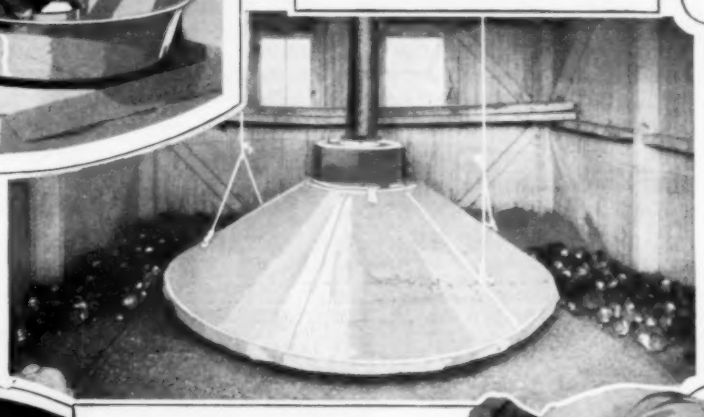
Semi-solid buttermilk as a drink for laying hens was tested, and found to be a successful substitute for green food. The same vitamines that are necessary for human growth are needed by the chickens.

Feeding experiments with both fish meal and tankage were successful, but the fish diet proved the best. The scientists were especially interested to determine whether a fish diet would affect the taste of either the meat or the eggs, but found it did not.

Gluten meal, a vegetable product, yielded the highest results in egg production. One white Leghorn pullet fed on gluten meal laid 310 eggs in 1926 and another was second with 300.

Strong Eggshells Are Necessary to Stand the Rigors of Shipment, and Fowls Are Especially Bred to Produce Them; Above Is the Test by Which the Strength Is Determined

Toe Punching a Chick to Record Its Breeding for All Its Life



The Tin Mother of the Baby Chicks Is a Vast Metal Brooder under Which They May Gather to Enjoy the Heat of the Stove in Its Center

Chicken Diseases Are Studied and Fought; at the Left Is a Sick Hen Waiting for the Doctor to Diagnose Its Ills, While at the Right Is an Attendant Treating a Parasite-Infested Patient to a Dusting in a Tub of Disinfectant to Rid It of Lice; the Studies Have Done Much to Remove the Hazards from Poultry Farming

CAFETERIA FOR FEEDING RATS AIDS IN FOOD TESTS

Weighing a Rat Subject, and Some of the Special Cages with Automatic Drinking and Feeding Containers

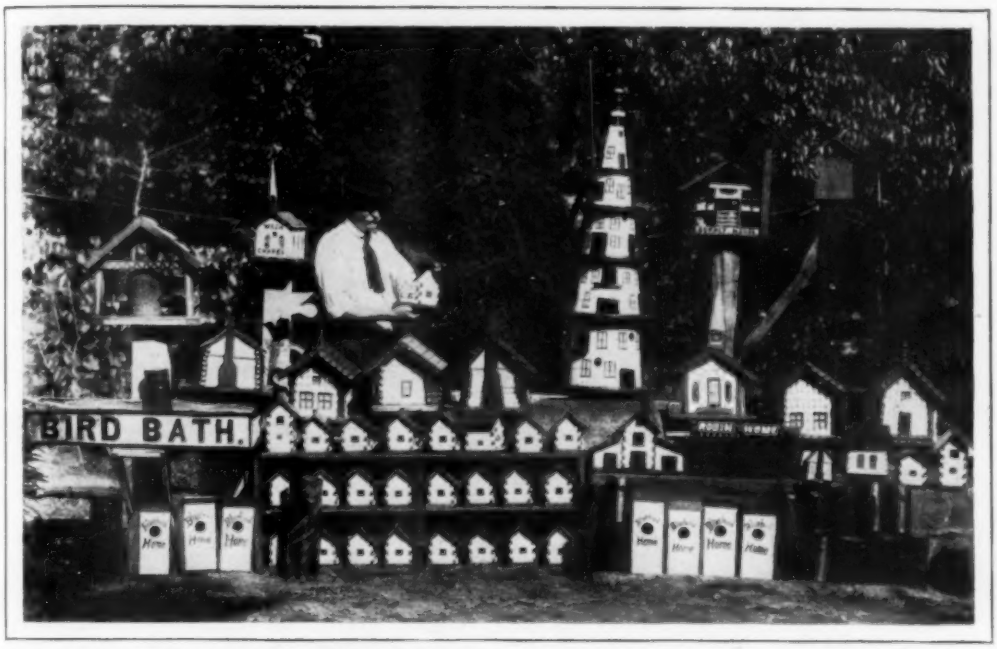
If the reactions of 4,000 rats are any index of what happens to human beings, ham or bacon and eggs may claim their popularity, not by accident, but because they are more nourishing when eaten together than if the meat is eaten alone or the eggs. For the past ten years, Ralph Hoagland, of the bureau of animal industry, has been conducting interesting experiments in feeding albino rats to determine how they thrive on different kinds of food. He has tended 4,000 of the creatures, and has constructed special cages with automatic drinking and eating containers so that the inmates may satisfy their hunger and thirst in cafeteria style. Among other important facts, he learned that lean pork, for instance, is rich in one vitamine but poor in another, hence the desirability of combining the meat with eggs which have a liberal supply of the helpful nutriment. The rats showed a distinct preference for ham sandwiches over ham or bread alone. They digested pork as easily as chicken. It was found that boiled ham, such as that purchased sliced in the market, is richest in protein, followed in relative proportions by lean smoked ham and medium fat smoked ham. Clean, fat salt pork, on the other hand, contains only a small amount of this food element. The bureau attributes the zest of persons doing manual labor for bacon and salt pork to the fact that either supplies 3,000 food calories. From other observations, it was estimated that twenty per cent of the pork cuts are maintained in salty and fresh condition, while eighty per cent are sold as cured products.

GEOGRAPHY TURNED INTO PLAY WITH SECTIONAL GLOBE

Study of geography is made a pleasant game with a sectional globe now on the market. It is so divided that each part represents a continent, and the countries in each section or continent are in blocks which fit together like a jigsaw puzzle. When all the sections are assembled, a complete globe, with a colored map of the world on the outside, is formed. The unit is suited for school or home use, is accurately printed and serviceable as a reference for adults as well as a toy for children. It is manufactured in various sizes.

Globe in Sections, Showing How the Puzzle Maps Fit Outside, and the Assembled Sphere on Its Holder; There Is a Section for Each Continent

MINIATURE CITY FOR BIRDS ATTRACTS WARBLERS



"Bird City," Where Feathered Travelers Find Comfortable Homes; the Bath Was Patronized by Eighty-Nine Birds One Hot Afternoon, and Many Return Each Year as Their Bands Indicate

A miniature city for birds, complete even to a church, a cafeteria, a supply house and a bathhouse, to say nothing of modern cabins and houses, has been built in Lawrence, Kans., by Frank L. Hunt. The wren cabins are made of beveled logs and are oiled and painted inside and out. The entrance is seven-eighths of an inch in diameter with no landing to tempt sparrows. There is a miniature chimney which may be used as a handle to open one side of the hinged roof. This enables the nest to be cleaned out in the fall. According to Mr. Hunt, a wren house should not be too large, as the birds will fill it almost to the lid no matter how big it is, before they begin to form their cup-shaped nest. A group of bluebird cabins is occupied every year, as are also the larger cabins for the purple martins. The latter are covered with spools. Martins are colony birds and seem to be more satisfied if several families occupy the same building. Last summer a pair of crested flycatchers took possession of one of the martin houses and raised a brood of four. This season a titmouse family occupied one of the cabins, and two broods of chickadees have been raised. Little cylindrical houses of rubberoid roofing are made for the woodpeckers. The supply house contains rooms filled with cotton, feathers, scraps of cord, binding twine and bits of fine wire. The upper room is for beef suet and scraps from the table. The bird bath is usually a very interesting corner in "Birdville." It is made of part of an old cooker, twenty by thirty-two inches by six inches deep, with a shallow floating bath for the smaller birds. On one sultry afternoon eighty-nine birds came to the bath for a drink or splash within an hour. One of Mr. Hunt's neighbors has a government license for trapping and banding birds in order to study their migratory habits, and to ascertain whether or not they will return year after year to their old nesting places. So far they have learned that at least fifteen different kinds have returned, proudly wearing their aluminum wristlets. Among them are the robin, wren, catbird, flicker, bluebird, dove, cardinal, brown thrasher, meadowlark, nuthatch, tufted titmouse, chimney swift, bluejay and the downy and red-headed woodpeckers.

TEACHING TRICKS TO LOBSTERS LATEST TRAINING STUNT

A New Recruit for the Trained-Animal Ranks; Teaching a Lobster to Do Simple Tricks

"Every creature has some degree of intelligence," scientists declare, and the assertion is supported by one of the most recent additions to the ranks of novel tricksters, a collection of trained live lobsters. According to reports, a ship's doctor influences the creatures by a sort of hypnotism and can make them stand on their heads and do other stunts.

END BLASTS ON BATTLESHIPS WITH ELECTRIC FANS

How efficient ventilation has stopped one of the worst horrors of the American navy, powder explosions in gun turrets, is an outstanding triumph of modern engineering. During gun practice, kegs of powder and dynamite are brought into the turret for ammunition. When the breech of a big piece was opened after a shot, air pressure from the outside sometimes whipped down the muzzle, blowing powder smoke and, occasionally, sparks back through the breech and into the turret. If these sparks came in contact with the powder stores, there was instant trouble, with loss of life, injuries and extensive damage the usual penalty. To counteract this outside pressure, special ventilating fans have been installed to keep the wind from blowing through the guns into the turrets. In the average installation, the fans were adjusted to pump about 5,000 cubic feet or 385 pounds of air per minute, eliminating the danger of explosions from the returning spark source and keeping out the fumes. In the new airplane carriers, "Lexington" and "Saratoga," each 888 feet long and 106 feet wide, electrical control of air for safety is being used to an extent never before attempted. Cabins and hulls of the ships are conditioned constantly at a temperature of seventy degrees and a relative humidity of forty-five to fifty per cent. There are 370 ventilating fans of various types on each ship, ranging up to a capacity of 40,000 cubic feet per minute, while 352 blowers are used to supply the boiler rooms, cool the main motors driving the ships' propellers and feed fuel to the huge oil-burning boilers.

RADIO ON WHEELS REPLACES THE STREET ORGAN

The traveling radio-concert man is replacing the organ grinder in Berlin. He wheels his set to neighborhoods where there are few receivers in the homes and tunes in a program from the air. The plan has proved more successful with the development of better types of loud speakers.

Giving a Radio Concert Instead of the Usual Hand-Organ Recital; the Traveling Receiving Set in Berlin

One Hundred Varieties of Lilies Are Raised in This and Eleven Similar Spring-Fed Ponds; Mrs. Helen Fowler, Owner of the Water-Lily Garden, Is Shown Gathering Selected Blossoms

Raising Water Lilies by the Millions

Twelve-Acre Water Garden Contains More Than a Hundred Varieties of Blooms

By G. H. DACY

THE unexpected death of her father plunged Mrs. Helen Fowler, Kenilworth, D. C., into the business of lily raising almost overnight. Today, her twelve-acre water garden, consisting of thirty ponds fed by springs, where she raises some hundred varieties of water lilies, is one of the commercial marvels of modern floriculture. During the peak of the harvest season, from June until the middle of August, she markets from 4,000 to 5,000 cut flowers daily, while she also sells thousands of roots for propagation at from $1 to $25 a piece. As a sideline to lily growing, this resourceful producer markets more than twenty-five different kinds of aquatic plants which are in demand for use in both private and public aquariums.

Mrs Fowler raises, among other varieties, the "Mrs. Richmond," the finest and largest water lily known to botany, whose roots sell for $25 a piece. She is the developer of the "Rose Aery," said to be the best commercial lily now offered on the world market, and also has produced the "Suffragette," a pure white lily whose blooms are six to eight inches in diameter. She is a master grower of the exotic night bloomers introduced from South America. These flowers, which sell for $6 a dozen, open their buds only at night, closing the blooms again the following morning.

The greatest wonders at this record lily garden are the amazing Victoria Regia

meaning of day and night. The lily imitates man, closing its buds and sleeping at night and not opening its bloom the following day until the sun is high in the heavens. Commercial lily harvest is based on this peculiarity of the aquatic plant. The pickers row about the lily ponds in boats between four and five o'clock in the morning. Rapidly they pick the buds in large quantities, rush them ashore, where they are cut, sorted, washed and packed in moist moss for shipment by parcel post, special delivery.

The cut flowers are distributed as far west as Kansas City, as far north as Portland, Me., and as far south as Atlanta. In all cases, the lilies are shipped in bud so that they are just beginning to open when they arrive at their destinations. These extraordinary flowers will last for seven to eight days if properly handled after delivery. The stems are cut and the buds are floated in shallow dishes of water. Each evening, the buds

The Victoria Regia, Giant of the Lily Family, Has Immense Six-Foot Leaves and Enormous Blossoms

lilies named in honor of Queen Victoria. Mrs. Fowler imported the foundation stock from South America via England. This is the mammoth of all water lilies both in speed of development and size at maturity. The seedlings, raised in greenhouse pots are removed to the pond in the early summer. Sixty days later, the Victoria Regia is fully grown. The plant is then thirty feet square with individual leaves that are six feet wide. This gigantic plant is so strong that it will support the weight of a fifty-pound child.

The water lily is a beautiful flower gifted with almost human intelligence as to the

close and go to rest while, the following morning, they once again open in full magnificence.

A curiosity at the Fowler lily farm is a colony of paradise fish—the famous fighting fish of Siam. These diminutive swimmers, only two to three inches long, are raised to destroy parasites which attack the lily plants. They are more courageous even than the fierce barracuda of southern seas, reputed as one of the most ferocious battlers of the ocean.

Mrs. Fowler also stocks her lily ponds with young fish of the game varieties, six to ten inches long. These fish destroy the colonies of mosquitoes which otherwise would infest the sluggish water.

FISH CAUGHT ON BAITED STONES CENTURIES AGO

Quantities of fish bones found in the cave dwellings of prehistoric man indicate that the art of fishing is at least 200,000 years old, and rude tackle equipment of the times shows that skill was probably even more important in landing a catch than it is now. The fish were speared with sharpened stakes, caught with the bare hands or in nets made out of branches. Hooks of flint came later, and among some of the oldest fishing tackle found are banana-shaped stones with a groove in the center. About this groove was fastened the line, probably a thong of rawhide. The stone was covered with meat and when the fish swallowed it, a quick twist of the wrist turned the "hook" crosswise in the fish's interior so that the catch could easily be pulled out of the water. This same method is used today by French eel fishermen, and by some Indians in catching salmon. The stone hook was supplanted by those of bronze, which were first fashioned without barbs, two being used together at right angles, forming a double hook which could not easily be shaken loose by the fish.

Ravages of the Book-Devouring Insects; Worm-Proof Paper Is Expected to Reduce This Loss

Removing Chicken's Feathers with Electrical Picker; Points on Revolving Arm Save Hand Work

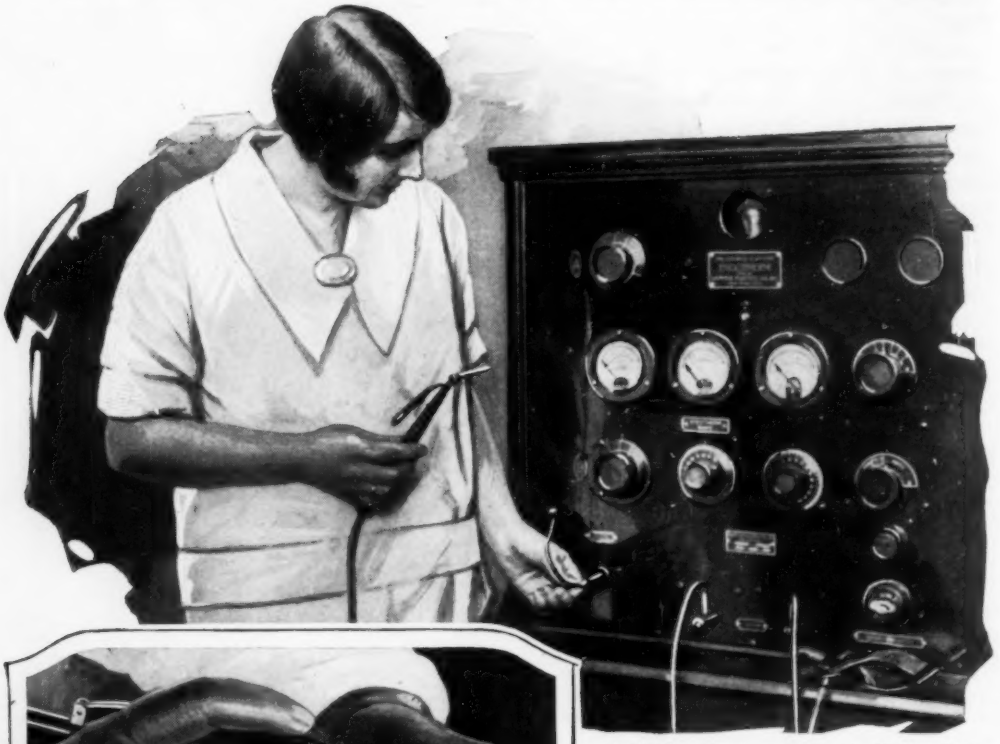
ELECTRICAL CHICKEN PICKER SAVES BUTCHERS' TIME

With a power chicken plucker developed in England, a fowl can be picked clean of feathers in one minute, according to reports. Projecting points on a revolving shaft do the work with little effort on the part of the operator except to handle the bird so that the flesh will not be torn.

PAPER PROOF AGAINST WORMS TO PROTECT BOOKS

Thousands of dollars in damage is the yearly toll of insects that attack library books, but reduction in this destruction is seen as a result of a worm-proof paper a Philadelphia librarian has introduced. He is said to have experimented with 160 species of worms, but all found the paper unpalatable. Most of the damage they do is in boring through the leaves to devour the bindings and paste, etc.

ELECTRIC KNIFE IS USED TO RESTORE LOST SANITY



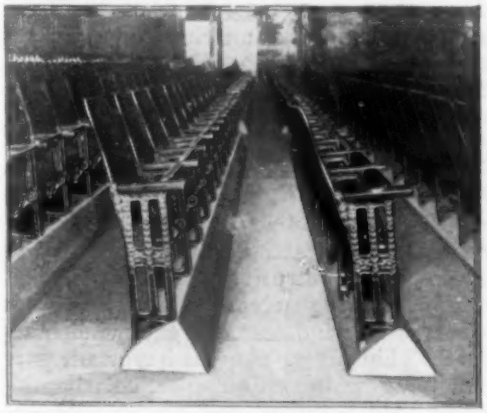
Switchboard of the Electric Knife, Above, and, at Left, the Knife Itself, Which Is Merely a Small Needle

Bloodless surgery, performed with the so-called "radio knife," can restore some insane persons to sanity, as well as make possible operations that have never heretofore been possible without fatal results, latest experiments with this remarkable new tool have disclosed. One of the diseases that has always baffled science, tumors of the brain, has been conquered in more than a score of successful operations by a Boston surgeon. Under former methods of operating with a keen-edged knife, brain tumors could not be removed because the patient would die of loss of blood. With the electric knife, which is not a knife at all but only a small, needle-pointed electrode, there is no bleeding. Advanced cases of this brain disease cause insanity, and in several of the operations which have been performed at Boston the patients were insane before they went under the electric knife, and came out sane again. The radio knife got its name because it employs the same sort of high-frequency current that is used in wireless. Ordinary house-lighting current is "stepped up" to an enormously high voltage and frequency, but only a minute amount is used. Under such conditions, it is possible to pass the current through the body without feeling it, though the voltage is high enough to jump a gap many inches long. The patient is placed on one electrode and the surgeon uses the other to operate with. An ordinary darning needle, or tool of similar size and

shape, is suitable. When the needle approaches the flesh a small arc is formed, and then the current begins cutting its way through the body, coagulating the blood and sealing off the adjacent blood cells as it progresses. By varying the current intensity, it is possible to seal only one thin layer of cells, or seal them to a depth of a quarter inch or more, just as desired. At the same time that it is cutting, it acts as a perfect antiseptic. Even in operations in which large blood vessels must be parted the electric knife provides a seal. The surgeon catches the ends of the severed vessel with small forceps, passes the point of the electric needle over them, and they are sealed as easily as a paper tube could be closed with mucilage. Because of its ease of manipulation, and the performance by the knife of work the surgeon formerly had to do by hand, the electric knife has shortened the time of operations materially.

ANCHOR FOR THEATER CHAIRS PROVIDES FOOTREST

One of the latest improvements in theater-seating equipment is a combination anchor and footrest for the chairs. It consists of a concrete ridge, the rear slope of which is inclined at such an angle as to make it suitable for a rest for the feet of persons of different heights. A channel between the anchors simplifies sweeping, allowing rubbish to fall into the center, prevents articles from rolling away and the ridges offer space for ventilators and tend to reduce drafts.



Theater Chairs on Concrete Ridge, Which Serves as Anchor and Footrest and Simplifies Task of Sweeping

QUOIT GAME WITH OLD TIRES GIVES GOOD EXERCISE

Another Use for Worn-Out Auto Tires; Play Quoits with Them

Automobile tires, no longer fit for service on the car, are used for pitching quoits in a variation of the ancient game. Strength and accuracy are both required, especially if the players stand far from the peg.

POWER STEERING FOR AUTOS EASES DRIVER'S TASK

Driving the automobile in or out of restricted spaces while parking and guiding it under all conditions are relieved of much of their difficulty in a steering gear that functions chiefly by power from the motor. The apparatus is mounted on the steering column just below the footboards and consists chiefly of two brake drums driven slowly in opposite directions. Each drum contains a springy brake band, one end of each being secured to the shaft carrying the worm of the usual steering-gear box mechanism. A turn of the wheel has the effect of expanding the proper brake band which meets the power-driven drum, turning the wheels to a degree corresponding to the steering-wheel movement. The take-up is said to be so rapid that steering seems to be done in the usual way but requires only about one-tenth of the effort. If the motor is not running, the car can still be steered easily, although greater force is required on the wheel.

How "CHEAT" LINES fool your eyes

R. H. Dietrich, Custom Auto-Body Designer, Making His First Sketch of a New-Style Car

By ROLAND MORE

A LONG, low "slinky"-looking car darts through traffic and speeds away. Lumbering after it comes a short-looking, high-sided, rather ungainly auto. Look up the manufacturers' specifications and you will find the two cars have exactly the same wheelbase. "Cheat" lines is the answer.

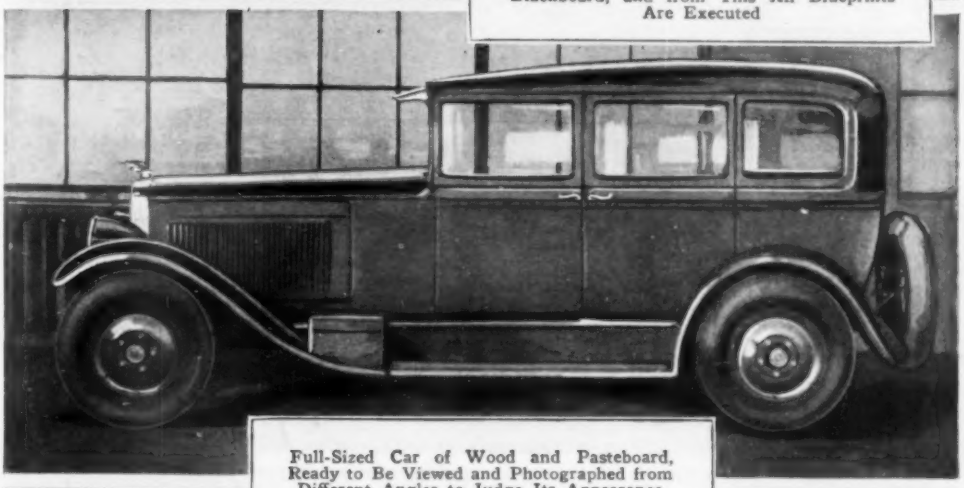
The cheat line, in automobile designers' parlance, is anything that is introduced into a body design to fool the eye, to make a car look longer or lower than it really is, thereby giving it that impression of speed and power which some cars have and others miss.

Take the convertible coupe-roadsters which are becoming so popular. Two manufacturers of higher-priced cars have brought out models of the same wheelbase, and one looks a foot or so longer and inches lower than the other. The difference in appearance lies not only in the general outline of the body, but in the molding treatment, color scheme, radiator and hood design, the curve of the fenders, and the size and shape of the windows.

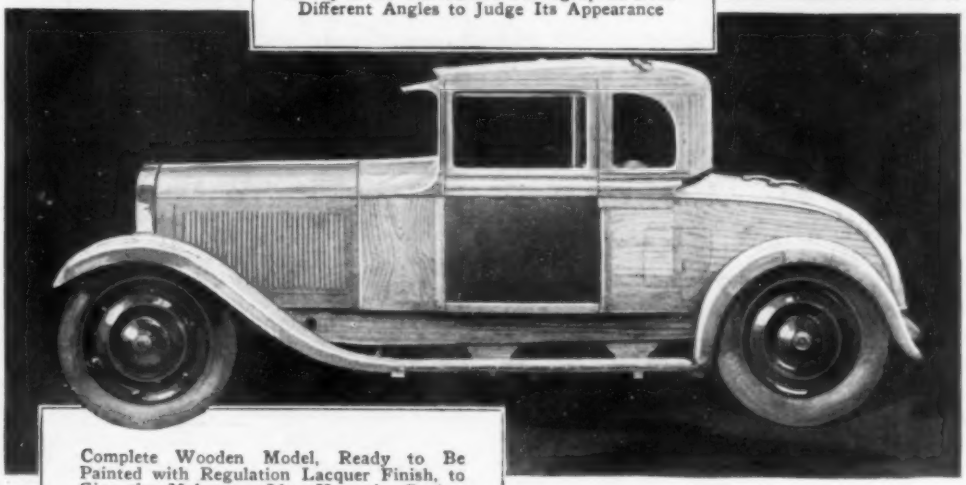
For many years it was standard practice to put three windows in the side of a sedan, the three being practically square and of equal size. Then an expert in cheat lines discovered that by making the windows of different widths—though the overall width of the three remained the same—he could apparently add several inches to the length of the car.

The science of cheating the eye in designing bodies is exactly the same as that of fooling the eye in designing clothes. Everyone knows that vertical stripes make a person look taller and horizontal stripes add apparent breadth. Fat people, therefore, shouldn't wear horizontal stripes, but automobiles, particularly if they have fairly short wheelbases, need them. The horizontal stripes of an automobile are the long fore-and-aft lines produced by body molding, fender lines, roof top, hood line and window spacing. Vertical lines are made as unobtrusive as possible, and confined to the necessary pillars between doors and windows and the windshield line. Thin pillars play an important part in giving wide vision, particularly the windshield columns, but are equally important in avoiding the sense of height.

From a Small Scale Drawing, a New Car Is Worked Out, Full Size, on a Mammoth Blackboard, and from This All Blueprints Are Executed



Full-Sized Car of Wood and Pasteboard, Ready to Be Viewed and Photographed from Different Angles to Judge Its Appearance



Complete Wooden Model, Ready to Be Painted with Regulation Lacquer Finish, to Give the Maker an Idea How the Design Will Look

The body problem goes back to the chassis design. If a chassis is long, seats may be placed low, with the passengers in a reclining position, plenty of leg room being provided by the long body. If the car is short, however, the seats must be raised to the knee height, the passengers must sit erect, and the body will be much higher. The task of the designer in making such a short body look long is quite apparent.

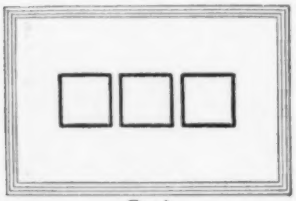


FIG. 1

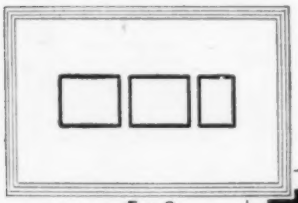


FIG. 2

Above, How Changes in the Width of Windows Alter Appearances, Though in Each Case the Over-All Length Is the Same; Right, Body Molding to Give the Look of Length

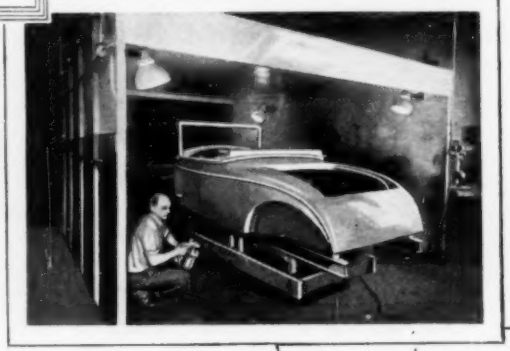
He starts out by "tying" the windows in the upper part of the body together in a long and narrow rectangle, the tying being accomplished by painting the window columns and a narrow panel above and below them in a contrasting color. A dark color is usually chosen for the upper part because it emphasizes the length of the rectangle.

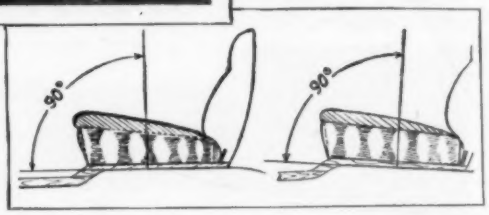
Below the windows, the designer will have a fairly narrow band of a lighter color, set off from the rest of the body by a narrow stripe or molding, carried the full length of the body and the hood. Sometimes, just above the frame, another dark molding line will run, to still further narrow the light body panel and provide a second long horizontal line to deceive the eye.

The biggest taxicab manufacturer in the country for many years painted his bodies in a bright yellow and hoods in black. The result was a short and dumpy-looking car. Then he brought out a new model with the hood in the same color as the body, and the result was an apparent lengthening of the machine by many inches.

R. H. Dietrich, one of the leading custom-body builders of the country, who, at thirty-three, not only has his own body plant but is also consulting designer to a half dozen or more of the leading automobile builders, is an expert in the use of cheat lines. Body design, he declares, is far from perfection yet. The structural and mechanical problems have been more or less solved, but the problem now is to build the body around the passenger, giving added comfort, rather than fitting the rider into a car that may be mechanically excellent but uncomfortable to ride in. To solve that problem, designers are studying anatomy to learn where the bones and muscles should rest when at ease.

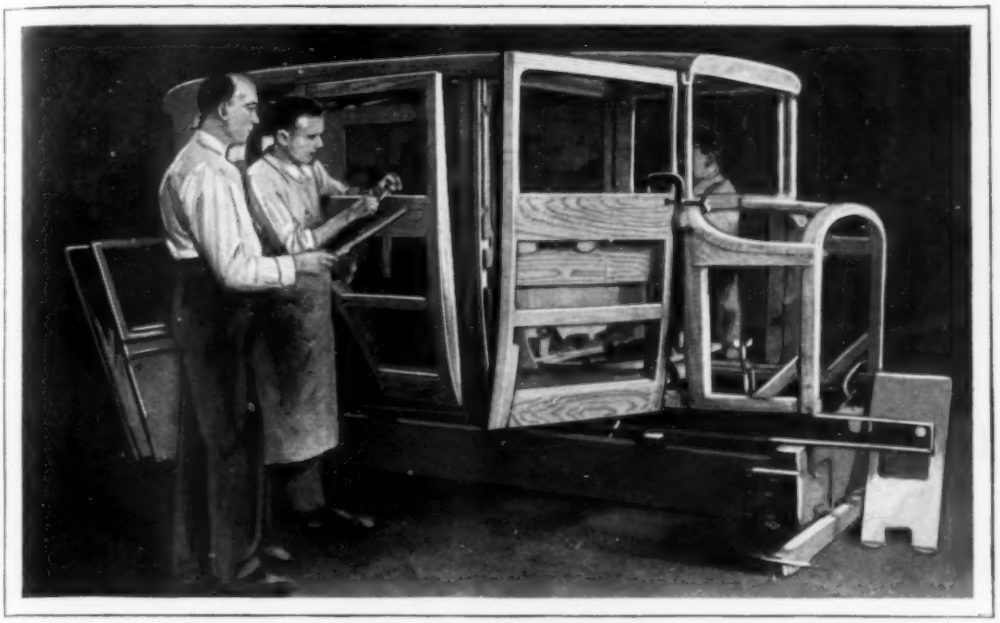
Many a person who has bought an expensive car, fitted with all the luxury accessories that can be crowded into it, has found himself exhausted after a 100-mile ride, Dietrich says. He tells a story of one of his own failures, when he had designed a fine custom body for a millionaire motorist. In a few weeks the owner came back and said the costly new car rode "like an ice wagon." Yet the upholstery was the finest, the seat springs of the deepest, and extra care had been taken to make the car comfortable.





Sloping the "Kick-Up" of the Frame, as at Right, Keeps the Rear-Seat Rider from Being Bounced Forward, as at Left

A study of its action on the road, however, showed that the owner, riding in the back seat, was subjected to the usual up-and-down bouncing as the car went over



Expert Old-Time Carriage Builders Are in Demand in the Body Departments of Custom-Built Car Plants, to Insure Perfect Joints, Forever Free of Squeaks and Rattles

bumps, and that each bounce slid him a bit farther forward, so that periodically he had to plant himself back in the seat again. Manufacturers had discovered the same fault in back-seat riding long ago, and installed footrails against which the passengers could brace their feet.

"We have now discovered," says Dietrich, "a way to really prevent this forward sliding. One maker has already adopted the change and others will follow. It consists in bending the frame by the rear wheel housing so that it runs parallel to the rear seat, in other words slopes slightly backward. Any bounce then will merely bob the passenger up and down without throwing him forward.

A study of fatigue, he says, has shown that high windows are more tiring than low ones, for the reason that the rear-seat passenger is inclined to focus his eyes on roof and tree tops. By lowering the tops of the windows to limit the angle of vision, the body builders get away from this chance of eye strain.

"I always begin with the interior," Dietrich says, in describing how a body is laid out." He illustrated his point with sketches of a body he was preparing for King Alfonso of Spain. "I draw the seats first. For the front seat the position of the steering wheel and pedals is the determining factor. After placing my seats, I figure on the necessary headroom and roof line. Here is where knowledge of the human body is necessary. We have found that whether a person is tall or short, the height above the seat will be fairly constant at thirty-three inches.

"For the front seat an angle of 110 degrees has been found the most comfortable—twenty degrees more than a right angle—with a bulge in the back of the seat, of course, to fit the small of the back. Front seats of sport cars are tilted still more, and front seats of town cars are made straight, to force the chauffeur to sit up with rigid dignity."

The first sketch of the body is drawn to a scale of one inch to the foot. Several color sketches are made to the same size to try out various combinations. Then it is copied full size on a blackboard.

In some plants the body is worked out full size in cardboard, like a movie set, supported by a hidden framework and with real tires and wheels attached. It is then viewed from every angle, and changes in lines and colors experimented with. Some factories even build up the cars full size out of wax or clay, waterproof them and then apply regular body lacquers.

Where Many Can Hear and Also See; Huge Clock in Passageway over Vienna Street Plays an Organ to Announce the Hours

STREET CLOCK PLAYS AN ORGAN TO ANNOUNCE THE HOURS

One of the sights in Vienna is a huge clock that actuates an organ instead of striking the hours by bells. The instrument plays national airs and can be heard for a considerable distance. The clock occupies a commanding position on the side of a passageway spanning the street from one building to another.

LIFE POSSIBLE WITHOUT OXYGEN CHEMIST FINDS

Certain bacteria can thrive without oxygen, but if the supply is cut off for three minutes, it spells death to a human being, Dr. W. Mansfield Clark, of the public health service, recently declared. Some of the higher forms of bacteria can get along without oxygen for greater or less periods, and it seems necessary for efficiency in all the higher forms of life. One of the handicaps to a better understanding of the mystery of life has been the assumption that oxygen is essential to all life, Dr. Clark pointed out, so that emphasis has been centered on the problem of the manner in which oxygen enters the chemistry of life. A shortage of oxygen first takes effect on the highest nerve centers, parts of the organism which are not present in the lower forms of life.

BOTTLE OPENER ON WALL SAVES FURNITURE

To prevent damage to furniture in hotels and other places through opening bottles, an opener now on the market is permanently adjusted to the wall. It has a rust-proof corkscrew and base designed to keep the bottle from slipping out and scarring the wall or woodwork, while a bottom hook can be used for holding a razor strop. The unit is attached with screws that a guest cannot remove.

To Prevent Damage to the Furnishings; Bottle Opener Attached to Wall Is Convenient for Travelers

Big Game Hunting in Rubberland

Outrigger Sailing Canoe of Sumatra, the Chief Method of Transportation for the Natives in the Malayan Rubberland; They Take Their Frail Craft Far Out to Sea on Fishing Trips

By EMMET DOUGHERTY

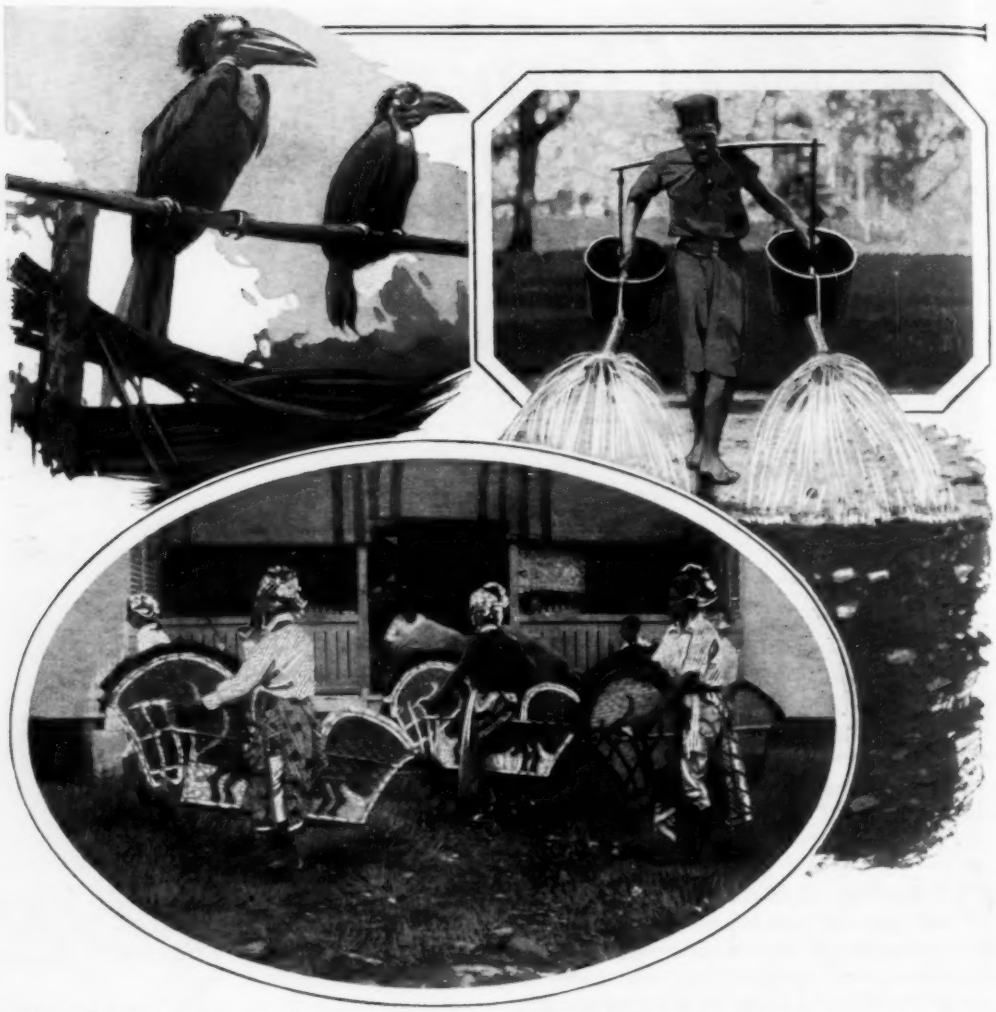
ON the top of Mount Kaba, an active volcano on the island of Sumatra, a band of native Malays were going through their religious ceremonies. A sacrifice was offered in the shape of a white pigeon, with pink eyes, for which the Malay chieftain paid $10 American gold.

The pigeon was turned loose over the crater of the volcano. If it negotiated the flight to safety over the seething mass of red-hot lava, which such birds rarely do, great ill befalls the natives. If the bird falls into the crater, which is generally its fate, all the wishes of the natives come true—rice and fruit will be abundant and the price of rubber bought by American users will continue high.

After a three days' climb through the jungles to the summit of Mount Kaba, this was the unusual scene unfolded before Lieut. Henry C. Kellers, a naval medical officer, who accompanied a recent expedition to Sumatra to witness the solar eclipse. Kellers spent ten weeks in the Dutch East Indies archipelago, bringing back 9,000 specimens of reptiles, birds, insects and mammals, living and dead.

Among the sixteen living birds brought back are a pair of black-crested hornbills, trapped by Dr. Kellers on the banks of the Musi river, near Kepahiang. Aside from their weird shriek, these birds are distinguished by the habit which the male has of building a mud wall to seal his mate up in her nest. At night, the female sticks her beak through the aperture, effectively plugging it. The purpose of this is to protect the eggs or young from snakes, wandering rats and monkeys.

Marine collections were gathered by Dr. Kellers in the Indian ocean and the Musi river, an outrigger canoe being used in deep-sea fishing and seining. Water reptiles, sea serpents, water snakes six and seven feet long, were collected on the reef off Poeloeticus. The draco, a flying lizard



Horse Dance of the Natives; Top, Left, a Pair of Black-Crested Hornbills Captured by Lieut. Kellers, and, Right, a Sumatra Version of the Street-Watering Cart

colored as beautifully as a butterfly, was one of Dr. Kellers' catches. He also caught a coral fish, which is a very rare species. Most of these marine specimens were helpless on land. All are poisonous and live on fish.

A nine-foot cobra, the most vicious snake that frequents the islands of Sumatra and Java, was killed with a gun. It had fangs three-eighths of an inch long, not unlike teeth, and when the mouth was closed they set in sockets in the jaw. Lieut. Kellers also saw a specimen of the diminutive mouse deer, which stands about a foot high, and sought to buy it from its native owner, but failed because the Malay feared all his family would be desolate if it were sold.

The tiger is the most feared of mammals in Sumatra. It represents the type of ferocity in the native proverbs and folklore. A distinction is drawn, however, between the tiger and the tigress in the way the two kill their prey. The former is said to break the neck, the latter to bite through it. Most of the other mammals do not seem to inspire much terror in the natives, though many are dangerous when hunted. Reptiles arouse great alarm. Crocodiles claim a much larger toll of victims than the tiger, while the more deadly of serpents are feared above all animals

because of the suddenness of attack and the certainty of death. The king cobra, because of its great size, is feared the most, although snake bite is of rare occurrence. Among the fables and folklore in Sumatra, the mouse deer is the "King of the Forest" and represents the triumph over the force of the tiger and the elephant.

The houses of the natives reflect another superstition. They are all constructed to keep out the tiger. The Sumatran native religiously believes the myth about the fight between the tiger and the carabao, or water buffalo, with the horned animal triumphing over its adversary. With these two animals in mind, the native builds his house on posts, raising it several feet to keep out the tiger. The horns of the carabao are represented in the shape of the structure, the upper portion being much wider than the ground floor.

The American gold piece is the most sought after trinket of the Malay natives, many of whom have become wealthy through their labors on rubber plantations.

SHIELD FOR AUTO RUMBLE SEAT FOLDS OUT OF SIGHT

For the protection of occupants of the auto rumble seat, a three-piece collapsible windshield has been designed. It swings down out of sight when not wanted, and is quickly elevated for service. It is adjustable for height and when folded does not interfere with the closing of the seat deck.

Shield Raised in Front of Rumble Seat, and as It Appears When Folded Up

FIREMAN'S SAFETY HEADLAMP FITS ON HELMET

Designed so that it can be quickly attached to the helmet, a safety light for firemen has been introduced by a member of the New York city department and an associate. It is turned on and off by a switch, and leaves the hands free while shining where it will most aid the vision.

Adjusting the Safety Lamp to the Helmet; It Is Controlled by a Switch and Leaves Both Hands Free

SCHOOL FOR DINING-CAR MEN TRAINS COOKS AND WAITERS

Dining-car waiters, stewards and cooks of the Pennsylvania railroad are receiving special training in a school at Columbus, Ohio, fitted to resemble a dining car in every particular, so that actual operating conditions on the road will be duplicated as nearly as possible. Waiters learn how to set the tables correctly, how to carry trays and deal with customers, and cooks are taught how to prepare the latest recipes found suitable for dining-car use after tests in the experimental kitchen. The "faculty" is composed of veteran workers, long in the employ of the railroad, and the course is continuous, constant training being given as new ideas and improvements are introduced in the service. Similar schools are to be established in Chicago and New York.

Examining the Underside of Virginia's Natural Bridge, at Staunton, to See if Traffic on Top Is Damaging It

SCIENTIST RIDES IN SWING SEAT TO STUDY NATURAL BRIDGE

Risking his life in a swing basket lowered from the top of the arch, Dr. Chester A. Reed, of the American museum of natural history, recently made a study of the natural bridge at Staunton, Va., to determine if vibrations from traffic over the span had damaged or were likely to injure it. The sling was the most practical way of examining the formation of walls and ceiling for close inspection to locate possible cracks and fissures. The bridge is 251 feet high.

REMEDY FOR RUST WANTED

A fortune awaits the man who invents a remedy for rust, one that will be as effective on a girder or a boiler as on a knife blade. According to conservative estimates, rust causes four billion dollars in damage throughout the world each year, not counting the costs and suffering resulting from loss of life occasioned by the collapse of rust-worn structures and similar accidents. Rust is responsible for costly depreciation in the value of houses and other buildings, railroad rails and rolling stock. One architect declared that a wise man, owning a house, would do well to build a special reserve fund of one per cent, $50 a year on a $5,000 house, to meet renewals made necessary by rust. A railroad expert estimates that the toll of rust on a line would be equivalent to a tax of nearly $4,000 each year on every mile of track. The chief problem involved is to put something into the metal which will not reduce its strength or increase its cost beyond a point that would make the process uneconomical.

LIGHT THAT PENETRATES FOGS TO AID AVIATORS

Raymond Machlett with "Hairpin" Light for Airplane Landings

Visible for fifty miles on clear nights and for tweaty through fogs, a neon gas light, developed for airplane landing fields and to guide vessels, has been tested by the bureau of standards. It has two tubes, hairpinlike

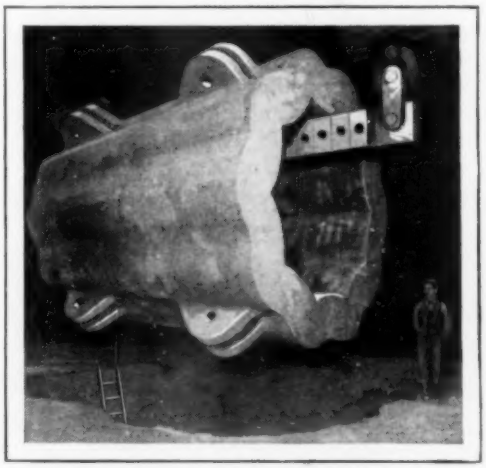
in shape, the gas inside being electrically agitated and each tube has a reflector of a rare mineral. They glow with a brilliant orange light which has such a long wavelength that it readily penetrates fogs instead of being diffused as is the case with rays from an ordinary incandescent light.

DEAD SEA IS TREASURE CHEST OF RICH CHEMICALS

Enormous quantities of valuable chemicals are held in solution in the waters of the Dead sea, according to Dr. Thomas H. Morton, who regards the historic spot as a potential source of great wealth, capable of supplying the world with important substances for years to come. Magnesium chloride, potassium chloride, common salt, usually pure, and magnesium bromide, serving for the production of various bromides, are among the chemicals found there in great abundance. For their separation, solar evaporation is the chief factor employed. Nearness to ocean transportation is another favorable factor.

INGOT-CASTING MOLD WEIGHS NINETY-ONE TONS

To be used in making large forgings, a huge ingot mold, cast at an eastern steel plant, weighs ninety-one tons, is fifteen and one-half feet long and 108 inches



Monster Unit at Eastern Steel Mill; the Mold for Making Ingots That Weigh Over 200 Tons

across at its outside diameter. It will produce an ingot weighing 247 tons.

WIDE VISOR FOR WOMEN'S HATS SHIELDS EYES FROM WIND

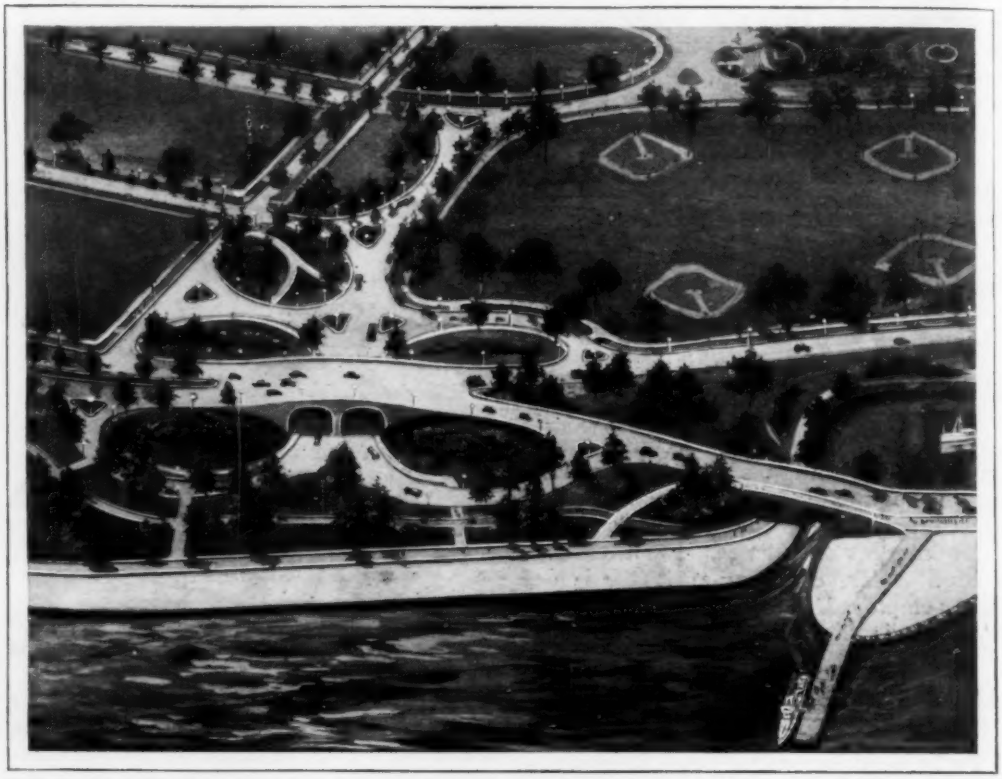
Carrying a Windshield on Her Hat; the Transparent Visor Protects Eyes and Face While Motoring

Especially suited to airplane travel or motoring, a woman's hat introduced in Paris has a wide, adjustable visor of transparent material to shield the eyes from the wind. It can be made of colored goods to afford protection from the sun as well and is considered a useful addition to the prevailing style of brimless turbans.

PLANTS TO SERVE AS ANIMALS IN LABORATORY TESTS

In the opinion of Sir Jagadis Chandra Bose, noted Indian scholar, it will be possible to use plants instead of animals for many scientific tests. He explains that plants register reactions to drugs and other stimuli, as do animals, but are not affected by fright as is the case with beasts. Under the influence of fear, normal reactions are often upset so that tests with animals are not always reliable, the scientist believes. With the aid of delicate instruments, he has demonstrated that plants have hearts and pulse and a nervous system akin to that of animals. In his tests, he has shown that various plants manifest definite reactions to stimuli and depressing conditions while making a fight for life.

OVERHEAD CROSSINGS SOLVE TRAFFIC PROBLEM



How a Busy Traffic Center at Entrance to Lincoln Park, Chicago, Has Been Arranged to Avoid Congestion by the Construction of Overhead Crossings, Permitting Safe Passages and Eliminating Delays

When commissioners of Lincoln park, Chicago, recently doubled the capacity of Lake Shore drive by adding a second boulevard, making two one-way streets, they faced an unusual problem at the entrance of the drive into the park. With the new street, there were six boulevards meeting at one point, the two parts of the double drive, North avenue, Stockton drive, and the old east and the new outer drive of the park. A bridge was built to carry the traffic of the Lake Shore drive double section into the east and outer park drives. Beneath the bridge four semicircular drives, leading out from each of the upper highways connected with Stockton drive and gave access to North avenue. When several hundred acres of new park land, being reclaimed from Lake Michigan farther north, is opened to the public, similar safety crossings will give access to all cross town streets through tunnels under the main through boulevard.

ELECTRIC TRAIN COMES APART TO HELP TEACH BOYS

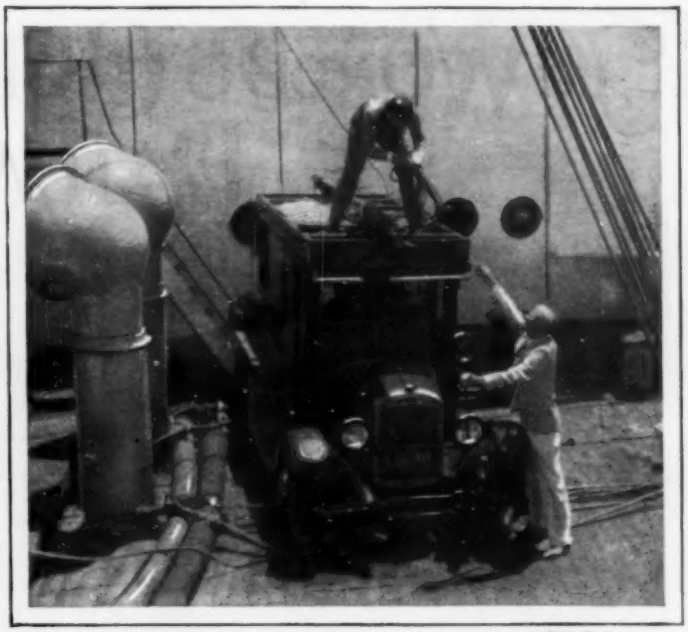
Taking the Electric Engine Apart; Motor Is Used to Run Other Toys

Amusement and education are afforded in an electric train that may be taken completely apart and put together again without the aid of tools and with little danger of making mistakes. The motor may be disassem-

bled and the parts studied and, in some models, it may be removed from the engine, placed in another housing and made to run other electric toys.

PORTABLE COOLER FOR FRUIT CARS

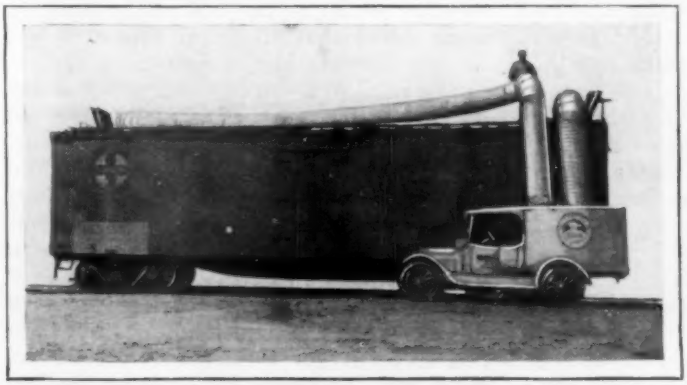
Shipments of fruit are often loaded into cars at California producing points in temperatures as high as 130 degrees, and unless special measures are taken, the shipment will not cool properly for several days. To insure rapid and thorough reduction of temperature, a portable blowing outfit has been used with success. It is mounted on an automobile truck, the motor of which furnishes the power to send a strong current of air over the salted ice in the car and throughout the interior, so that effective cooling is attained in a few hours. Hot air is forced out at the same time, through reinforced-canvas exhaust tubes, three feet in diameter. By the use of ethylene gas, fruit can also be pre-ripened as it is being chilled to thirty-eight or thirty-six degrees Fahrenheit. As an average of 700 cars of fruit and vegetables are shipped daily from southern California and the plant travels from one to another of a line of cars, it performs an important service.



Portable Broadcasting Station on Board "City of Honolulu," for Concerts during Voyage to Hawaii and Return

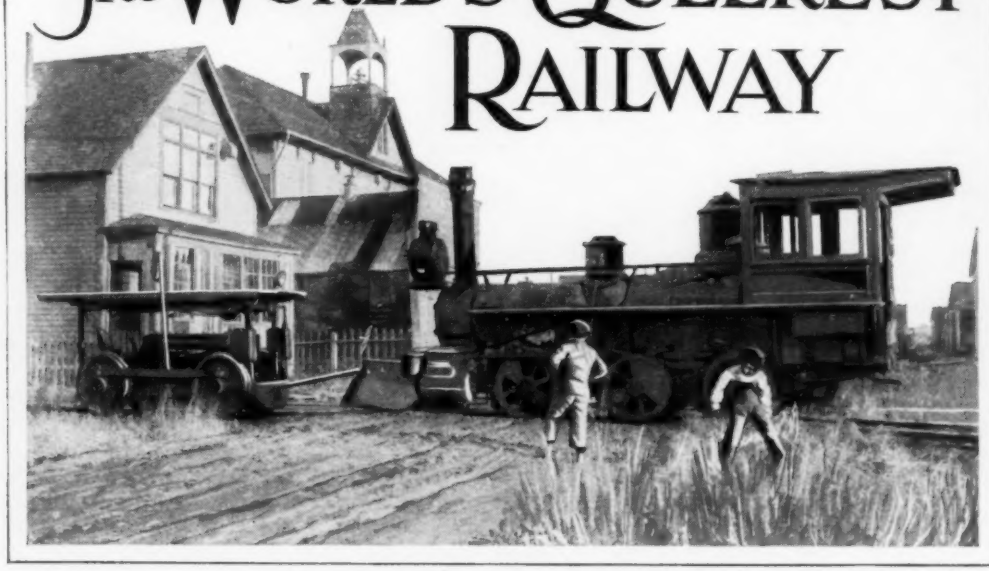
RADIO STATION GOES TO SEA TO AMUSE TRAVELERS

Radio station KGFO recently went to Hawaii and back aboard the "City of Honolulu," affording passengers on the liner daily programs and giving the captain the unique opportunity of addressing travelers in his charge through a microphone from his cabin. The set, which is mounted on an automobile truck, was taken ashore on the island of Oahu for a tour through Honolulu and near-by territory. Radio experts pronounced the experiment a success in every way and point out that, if such a plan becomes widely adopted, there will be increasing need of an international commission to regulate broadcasting for entertainment purposes while at sea. During the voyage, the auto truck was securely lashed to the deck to prevent mishaps, and the antenna was strung to the crow's nest on the mainmast.



Blowing Air over Ice in Refrigerator Car, to Speed Cooling of Contents; Outfit Is Quickly Set Up at Different Cars

The WORLD'S QUEEREST RAILWAY



A Railroad Tractor and One of the Ancient Steam Engines of Alaska's "Pupmobile" Road, Where the Customer Furnishes His Own Transportation over the Government-Owned Rails

THERE may be some dissension among railroads as to which is the shortest line in the world, but there can be no controversy as to which is the most curious.

There is no road in the world that can compare with the "Pupmobile" line, a bit of track that was laid in the early days after the gold strike in Alaska, between Nome and Shelton, on which real trains operate, drawn by teams of dogs.

From about 1908 to 1913 it was operated as a steam railroad. The road was abandoned in about 1913 and from that time until it was purchased by the territory of Alaska, no traffic was maintained, several bridges went out and the track fell into disrepair. However, it continued to be used by dog teams drawing light cars and sometimes carrying loads of as much as 1,000 pounds. Where a bridge was out or the track impassable, the car was taken over land across the gap and again placed upon the rails.

In 1923, this line was purchased by the territory of Alaska. It was turned over to the Alaska road commission for improvement and since that time all bridges have been replaced, other gaps in the line have been closed, and the track has been made suitable for use not only by dog teams but by gasoline speeders—automobiles equipped with flange wheels and Fordson tractors fitted for operation on the line. It is capable of carrying loads not exceeding four tons. The line has been used to a considerable extent by a mining company. It has served especially well in hauling out heavy pieces of equipment to the mine location which is just a few miles from Nome.

One company, organized last year, operates an automobile and a tractor, giving regular service to the end of the line. It is expected that traffic of this sort will largely increase in the future.

The rules of some of the largest railway companies are no more carefully observed than are those of the Pupmobile line. There are sidings and passing tracks and schedules are arranged so that cars meet at certain of these places for passing, but when two cars chance to meet between sidings, it is the rule that the lighter load must give way to the heavier—provided the man with the light load does not happen to be larger than the driver of the other car. The train which must give up the right of way is simply lifted from the

An Old Handcar, Propelled by Six or Eight Dog-Power, Constitutes the Most Usual Equipment When a Party of Eskimo Belles Go for a Ride on the "Pup-mobile" Line; Two Native Girls, One Eight and the Other Eleven Years Old, Operated a Regular Dog-Team Train through Forty-Five Miles of Wilderness

Converted Flivvers with Flanged Wheels Are the High-Speed Express Trains of the North; They Also Have Baggage Compartments

A Gasoline Tractor and One Small Flat Car, Doing Repair Work on the Railroad Fill under Jurisdiction of the Alaskan Road Commission

track and when the way is clear again is lifted back and goes on its way.

One train in particular, consisting of four small-wheel flat cars drawn by three dogs and carrying about fifty pounds of baggage, was recently operated by two Eskimo girls, aged eight and eleven years. They attended to the switching and appeared as unconcerned at traveling forty-five miles alone through the woods as any veteran trainman in the States.

The road, though owned by the Alaskan territory and operated by the Alaska railroad commission, is actually open to the public, and anyone may travel over it.

GIRLS FOR SPECIAL WORK ARE PICKED OUT BY MACHINE

To Test Candidate's Skill at Co-Ordinating Brain and Fingers; Key Apparatus Which Registers Response

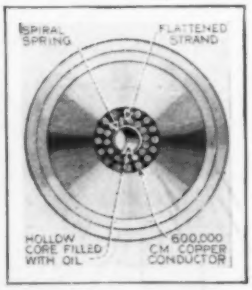
Selecting young women to operate a special printing device is simplified by a large company, which hires and trains some 2,000 girls a year, by the use of an instrument that shows how well the candidate can co-ordinate her brain and fingers. There are eight keys, one for each finger. The thumb is not used. Red figures are for the left hand and black for the right. As certain numbers appear on a dial, the operator is required to touch corresponding keys with the proper fingers for each hand. Errors are registered so that, at the end of the test, the examiners have an accurate record of the young woman's performance and can determine whether or not she is likely to prove a success with the instrument she would be hired to operate. An even pace is necessary, and the tester indicates whether the candidate has this.

INSECTS DRAWN TO FLOWERS BY COLOR AND ODOR

Flowers attract insects by both color and odor, while form, and such markings as stripes or dots, also help to guide the visitors, in the opinion of investigators for the Carnegie institution, who have conducted a series of tests at the Pikes Peak laboratory for nine years. They discovered that blue is the most popular color among bees and other insects, red the least. Even when blue flowers were turned upside down, the bees eagerly sought them. Many bumblebees were baffled by the new position and found difficulty in mastering the problem of sipping nectar from the inverted blossoms. Bees showed evidence of the best memory, recalling places, odors, shapes and colors and knowing the time of day when the nectar flows. They never touched orange lotus blossoms, seeming to realize that the nectar stopped flowing after the flower had changed from yellow to orange. Fragrance attracted insects of various kinds from a distance, but color only within a radius of about thirty feet. Bees, butterflies and other specimens were not fooled by artificial flowers and disguising blossoms by painting did not prevent them from recognizing their real nature. When bright-colored petals were reduced, the number of visitors fell off.

HIGH-VOLT LINE UNDERGROUND SHOWS CABLE PROGRESS

Successful transmission of a 132,000-volt electric current underground, is being made over a six-mile stretch in Chicago through the use of a special cable, representing the latest ideas in insulation. Its most interesting feature is its construction. At the center, it carries thin oil that passes around the copper strands of the conductors to impregnate the paper insulation. The oil is under pressure to prevent voids in the insulation, and to limit loss in case of a failure, the line was di-



vided into six one-mile sections connected by special joints, in which the oil from the adjacent sections is separated. Reservoirs containing about ninety gallons are mounted forty feet above the ground at one end of each section and connected by pipe lines to the hollow space in the conductor to maintain pressure on the oil. This system of insulation has proved superior to previous use of grease or heavy oil. The cable really consists of three, each a single conductor for one of the three-phase currents, making eighteen miles in all. The protective covering includes two lead sheaths, separated by a few layers of impregnated paper and wrapping of hard-drawn copper ribbon. The latter is applied to assist the lead sheath to withstand the internal pressure of the oil during operation.

NEVER TOO OLD TO LEARN

Groups of adults, averaging forty-two and twenty-two years of age, learned more in an hour than did children comparable in brightness, tests at Columbia university showed recently. The older group of adults learned about five-sixths as fast as the younger. According to Prof. E. L. Thorndyke, the common belief that children always learn faster than grown-ups is a delusion. Experiments with adults learning algebra, science, foreign languages and the like in evening classes, or shorthand and typewriting in secretarial schools, support the conclusion that ability to learn rises until twenty.

Shielding the Engine Crew from Smoke Fumes While Passing through Tunnels; the Gas Masks Used on Australian Lines

GAS MASKS GUARD ENGINE MEN PASSING THROUGH TUNNEL

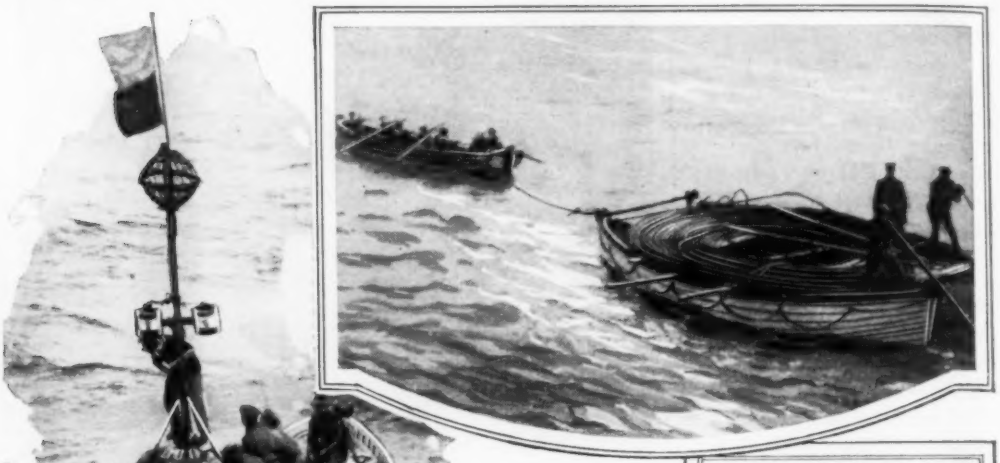
To protect them from fumes while passing through tunnels, engineers and firemen on trains in Australia have been wearing a special type of gas mask. It is designed for quick removal or adjustment and, while allowing an unobstructed view, keeps the smoke from entering the lungs.

AIRPLANE CAN DROP ITS MOTOR FOR EMERGENCY LANDINGS

To reduce the hazards of landing an airplane under forced conditions, a San Francisco inventor has worked out the model of a ship so arranged that the motor and landing gear can be dropped by simply pulling a trigger, leaving the wings and fuselage free to slide safely down. The plan would practically eliminate the danger of fire and explosion and would increase the gliding radius of the passenger-carrying portion of the ship.

Inventor with Model Showing How Motor Can Be Dropped, Leaving Fuselage Free to Glide to Safety

THRILLS IN REPAIRING BREAK IN SUBMARINE CABLE



Towing a Section of Submarine Cable Ashore, to Link Up a Telegraph Circuit between Two Continents; the Cable Must Be Carefully Handled to Avoid Kinking

When a Broken Cable End Is Raised, It Is Attached to a Marker Buoy Pending Repairs

Huge Grappling Iron, Above, Which Has Been Broken by Contact with Rocks on the Sea Bottom, While Trying to Find the Cable; at Left, Workmen Repairing the Armored Sheath, the Last Step in Making a Solice in the Cable before Returning It to the Ocean, Ready Again to Transmit Messages

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SAHARA DESERT ON THE MOVE BURIES RICH TREASURE

Since the dawn of civilization, the sands of the Sahara desert have shifted hundreds of miles to the eastward, burying many forgotten cities and centers of population. Some of the ruins on the western side are being found. Not long ago, the body of an ancient queen was discovered beneath the sand. On her arms were eighteen bracelets, nine of gold and nine of silver. Around her neck were five strands of jewels and a diadem of gold starred with gems was on her head. Emeralds, rubies and finely carved furniture were taken from the tomb, which is believed to have been built at least 1,000 years before the Christian era.

PERFECT SWING FOR GOLFERS TAUGHT BY MACHINE

A golf-practice machine, which makes it impossible for the golfer to complete a stroke that is not scientifically correct, has been developed by two Davenport, Iowa, players, one a dentist and the other a manufacturer. The machine has a club shaft with a special head attached to a track in such a way that it can only be swung through the backswing, downstroke and follow-through, when the player is standing correctly and performing properly. Otherwise the club head is automatically locked until the fault has been corrected. Slow-motion movies of several famous players were analyzed to perfect the curves of the track. The manufacturers claim that frequent use of the machine, either to improve one's stroke, or merely as a daily exerciser of the muscles used in golf, will so impress the stroke on the player that he automatically follows the same path in his strokes in actual play. The device has been patented in this and other countries.

Where the Golf Club Runs on a Track to Teach the Correct Stroke

Roller-Skate Shopping Bag, One of the Products of a Detroit High-School Manual Training Department

ROLLER-SKATE SHOPPING BAG SIMPLIFIES MARKETING

Students of the manual-training department of a Detroit high school, have organized their own marketing association to sell their products. They have their own sales manager, and articles made during the summer months are introduced to commercial firms, the profits going to the makers, some of whom have started funds for their college courses. Among things already made by the students is a shopping bag on rollers. With it a woman can easily carry her purchases home with one hand and manage the baby carriage with the other. A speedy egg beater has also been devised. It is placed inside a quart jar, and the eggs are beaten simply by shaking.

For Easier Pouring from a Barrel; the Tipping Rack in Operation; It Is Made of Metal

TIPPING RACK TO HOLD BARRELS SIMPLIFIES DRAINING

Quickly assembled from durable metal units, a cradle to hold barrels and drums of liquids makes it easy to draw off the contents. The rack is of convenient height, well balanced and is easily placed in service or disengaged.

ROMAN CANDLES ROUT BIRDS

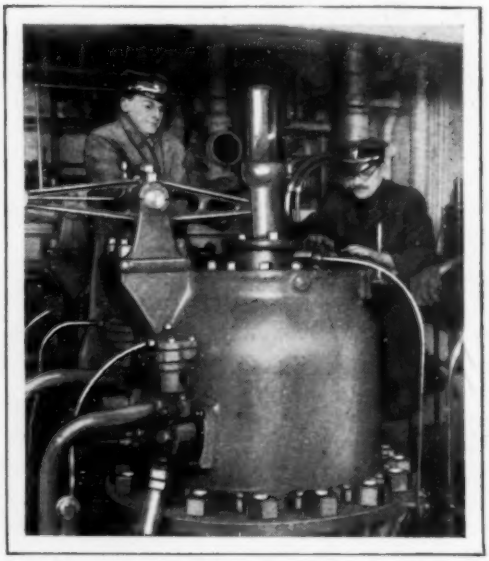
Although the law forbade shooting the birds, people of Newport, Ark., discovered an effective way to drive out a plague of martins by using fire hose, blank cartridges and Roman candles. The last proved especially useful, for the birds were terror-stricken by the balls of fire falling among their roosts at night and quickly sought other quarters. More than 10,000 martins flocked into the town, driving out other birds and causing damage to the trees. Other places in Arkansas, which also were troubled by the pests, used similar means to get rid of them.

ELECTRIC PLOW SPEEDS CROPS AND KILLS WEEDS

By transmitting more than 100,000 volts of electricity into the soil from a tractor plow, an eastern experimenter is reported to have developed an effective way for eradicating weeds and grubs from the ground and hastening the growing of crops. Current is supplied from a special generator on the tractor and is conducted through the blades of the plow. A field of buckwheat treated in this manner grew nearly twice as high as another, which had been given 200 pounds of fertilizer to the acre, and the seeds germinated in eighty hours. In tests with fields of corn, beans and potatoes, it was found that germination occurred in five days under the electrical treatment, whereas sixteen days were needed with nothing but the fertilizer. The sections cultivated with the electric plow were free from weeds.

SHIP'S ENGINE ROOM IS SO COOL CREW WEAR OVERCOATS

Ordinarily, the engine room is one of the warmest places on a ship, but the Diesel motors in the "Tampa" have been equipped with so efficient a cooling system that but little heat is radiated. Members of the engine crew wore their overcoats during a voyage last winter.



Engine Room of the "Tampa"; So Little Heat Is Radiated, Crew Wear Overcoats in Winter

Carrying City Bargains to the Country Buyers; the Traveling Store Now Popular in German Rural Districts; Customers Are Entertained with Radio Concerts Received by Set in Bus

BIG AUTO AS TRAVELING STORE ALSO GIVES RADIO CONCERTS

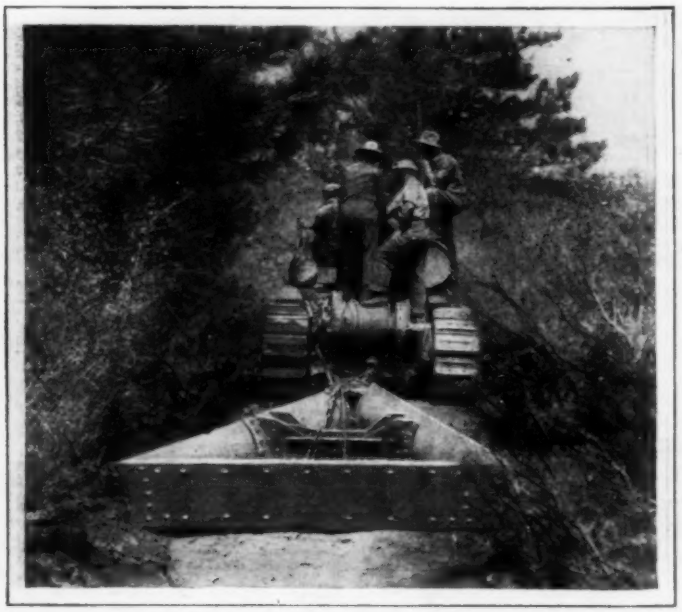
Stocks of goods as offered in the city stores are made available to customers in rural districts in Germany by traveling shops, specially built automobile trucks equipped for show and sales purposes. They afford wide display space in outside windows and carry large enough stocks for lengthy tours. An additional feature is the radio set, part of the car's fittings, which gives concerts to the customers while they buy and examine the wares.

MAIL CLERKS MUST REMEMBER THOUSANDS OF NAMES

Remembering the names of 5,000 different stations is one of the tasks of the average railway mail clerk, who submits to an examination once in six months to test his memory and skill at sorting mail. Besides being an expert in this line, he is trained to decipher difficult handwriting and often displays more skill in this than the person working in the post office, according to J. L. Stockton, newly elected president of the eleventh division of the railway-mail association. He declares that the most highly educated persons are often guilty of the most illegible mistakes in penmanship and addressing mail, and believes that it will be a long time before airplanes supplant the railways in carrying mail because the volume of the business would require too large a number of aircraft to be practical.

LEATHER CASE TURNS WATCH INTO TRAVELING CLOCK

A leather case that converts any watch into a traveling clock is one of the latest novelties from Europe, which has been specially designed to accommodate the fairly large-size cheap watch of American make. A cloth pocket, drawn tight by an elastic band, holds the watch firmly in place, while the usual bellows extension of the case cover accommodates watches of varying thicknesses when the case is closed.



Uprooting and Cutting Brush Likely to Spread Fires; the Plow in Action on California Forest Tract Where Dry-Season Blazes Occur

PERIL OF BRUSH BLAZES CURBED WITH FIREBREAK CUTTER

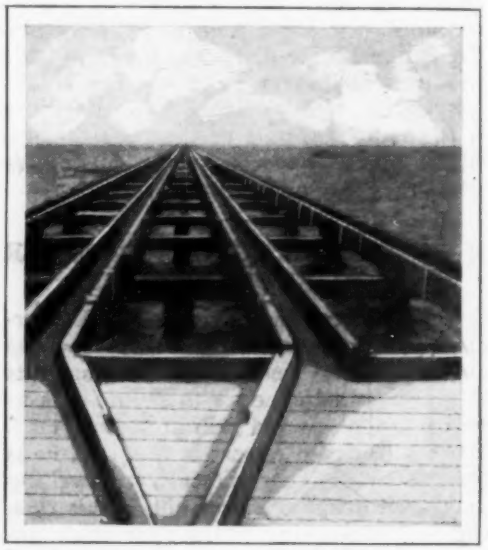
Devised especially for cutting through brush, a firebreak plow, demonstrated in California recently, is expected to prove of great aid in preventing the spread of conflagrations starting in dense undergrowth. It operates rapidly, ripping and cutting a swath through the brush, much faster than men can do it. One of the chief troubles in combating fires of this kind has been the time it takes to make a gap through dense thickets.

SAFETY OF AIR TRAVEL SHOWN BY CHANNEL RECORD

Between December, 1924, and July, 1927, planes of the British imperial airways flew 2,000,000 miles and carried 36,500 passengers without a fatality. According to reports, cross-channel flying is becoming more popular. In June this year, 2,460 passengers were carried as compared with 2,098 for the same month last season. The air union reported 1,060 passengers for the month this year as against 852 during the period last year. Between fifty and sixty per cent of the passengers were women, the report stated.

TROUGHS IN AUTO DRIVEWAY SAVE COST OF PLANKS

One of the longest beach drives in the world is now available to motorists from Corpus Christi, Tex., to Point Isabel, near Brownsville, and an outstanding feature of the route is a double-tracked causeway built across a shallow stretch of water between the mainland and a sandbar. Instead of an ordinary viaduct of planks or other material, this part of the drive is essentially a two-track road of troughs or grooves for auto wheels. In the bottom of each trough is a concave filling of asphalt so that the wheels are kept in the middle and cannot rub on the sides, and every eighteen inches is a hole to allow water to drain off. The tracks are made of creosoted planks on cross timbers and are securely bound together with heavy iron straps. The plan of construction proved a considerable saving over full planking.



Where Autos Run in Grooves across a Stretch of Sea; Motor Causeway near Corpus Christi, Texas

Carrying on BURBANK'S WORK

By H. H. DUNN

New Giant Asparagus Which Luther Burbank Completed in the Last Year before His Death; the Entire Stalk Is Edible

LUTHER Burbank's spirit is to go marching on, though the hand which developed new forms of beauty in blossoms and new utilities in vegetables, grains and fruits is stilled. Almost on the anniversary of the passing of the plant wizard, his wife announces that all his experiments are to be continued. There are more than 900 of these separate tests. One hundred of them were at the point of successful completion when the aged lover of plants passed on in the spring of 1926; about 400 were well under way on the farm at Santa Rosa, Calif. The remaining 400 are on paper. All will be carried on, just as Burbank would have continued with them.

So quietly that no one knew of it, Mrs. Burbank began last year the distribution of her famous husband's two last-completed gifts to man—a new nectarine and a new asparagus. He considered them his greatest developments, more important even than the Burbank potato, the Burbank plum, or the rust-resisting wheat which is now being grown over hundreds of thousands of acres in northern United States and southern Canada. The nectarine is the result of eighteen years' experiment. Its fruit is nearly twice the size of that of the nectarine now grown, with firmer flesh, and a seed, or stone, less than half the size of that of the present fruit. It endures long shipment, even when picked nearly ripe, and is of a flavor closely resembling that of a ripe strawberry.

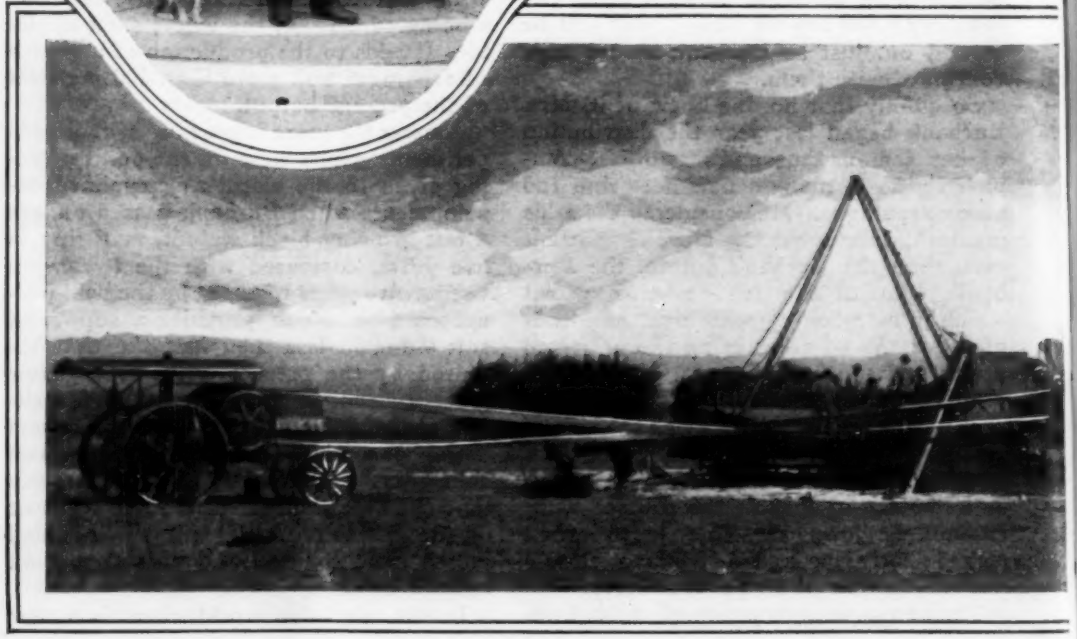
The new asparagus produces stalks from eighteen to twenty-four inches in length, with the tough, stringy base entirely eliminated, so that the whole stalk is edible. It adds to the production of any area of asparagus soil more than 100 per cent of the present output.

Among the more important of those experiments which were on the point of being given to the world as completed developments when Burbank passed on, are a fast-growing black walnut, maturing in five years, compared with the twenty to twenty-five years required by the wild walnut; a pine which provides a supply of soft wood in less than half the time required by the present white and yellow pines, a development of the tamarisk, well-known in India and Africa and grown largely as a windbreak, and a new form of eucalyptus of much more rapid growth than the blue and red varieties now grown on the Pacific coast. This last is intended in the main for fuel and post supply on interior farms.

In the vegetable world, there is a new

rhubarb with stems from two to three inches in thickness, tender and edible all the way from root to leaf, a distance of about twenty inches. Aside from the new asparagus, already mentioned, there is a radish, a foot in length and three to four inches in diameter, one of which, sliced, will serve as many persons as a dozen or more of the ordinary kind. There is a beet six inches in diameter, a turnip of the same size, out of both of which, as from the radish, Burbank took that pithiness which spoiled so many of the larger varieties of both vegetables. An artichoke, with a bud six inches in diameter and flower ranging from twelve to twenty inches across, is another. White onions, producing normal bulbs four to six inches in diameter by three inches in thickness, are among the virtually completed developments in vegetables, and a peanut twice as large as any now grown, with greater production per plant, is included.

In the fruits, aside from the new nectarine, which bids fair to rival the famous Burbank plum, there is a mango designed to grow on dry land, and in all the states from Kentucky southward to the Gulf of Mexico and westward to the Pacific coast. There are also two apples of which it may be said that there "ain't no core" and several new berries—developments of the strawberry, raspberry, blackberry and of the celebrated "sunberry," which Burbank produced a few years ago. Heavier production and larger individual fruits are promised from these berries.



Left, Last Picture of Luther Burbank, and, on Opposite Page, the Plant Wizard Discussing Experiments with His Wife

Among flowers, there are a dozen new roses, more vividly colored and with heavier fragrance. New flowering shrubs, some grown from wild plants sent to Burbank from the Himalayas, appear, and there is a pansy whose blossoms are three inches in diameter, Geraniums, whose very large and gorgeously colored bloom makes the present brilliant flowering plants seem tame, are growing in the experimental gardens at Santa Rosa.

Luther Burbank announced, shortly before his death, that he would present to the world, within the succeeding year, at least twenty-five new and commercially valuable trees, fruits and vegetables, with a similar number of flowering plants. While that year has passed, it is Mrs. Burbank's belief that, from the nearly completed experiments he left, she will be able to offer twice this number within the next year.

Among the things Burbank hoped to do was to make the vegetable garden a thing of beauty as well as utility. To this end he already had produced a flowering leek, an artichoke with large and brilliant blossoms, a mustard with large and heavy golden flower spikes, potatoes with purple, yellow and white flowers, and rhubarb with an ornamental floral offering. He had other similar developments planned, and these, too, will be carried out, without detracting from the value of the plants as producers of food.

During the time since the cessation of the plant wizard's labors, Mrs. Burbank

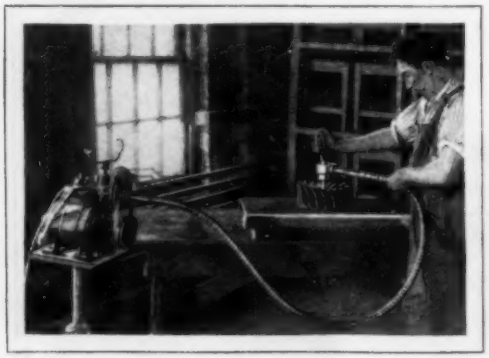
Below, Threshing Five Acres of Sweet Peas, Just like Wheat or Barley, to Get Seed for Sale and Experimental Work

Part of Burbank's Five-Acre Sweet-Pea Experiment; This Fall Twenty Acres Are to Be Planted to Sweet Peas to Raise the Millions of Flowers Needed in Developing New Species

has kept those new plants which were most nearly completed growing and developing on the experimental farm at Santa Rosa. Now, these farms are to be turned over to plant experts, some of them trained under Burbank, and all to be led by the woman who had a more intimate knowledge of the marvelous processes by which her husband worked than any other person in the world.

ELECTRIC WOOD-FILLER RUBBER SAVES WORK BY HAND

For rubbing fillers into wood panels, a motor-driven padded wheel has been devised as a substitute for hand methods. It is said to grind the filler into the surface much more uniformly than can be done in other ways, makes the work easier and saves time. The one-half horsepower motor is operated with current from a lighting socket, a three-speed countershaft is provided, and the wheel, which is reversible, has eighteen sections of rubbing felt pads. The outfit is mounted on a column with swivel base, or on a suspension base with tie-rods, and can be operated with unskilled labor.



Applying Filler to Wood Panel with the Electric Rubber; It Forces Material into Grain without Damage

PLANES LAND ON SKYSCRAPERS BY REVERSING "PROP"

Invention of a propeller-reversing device to permit stopping of an airplane within twice its own length after it touches the ground, has been announced by C. Francis Jenkins, of Washington, D. C. It is expected to make operation of planes within a city practical, as they can land on the tops of skyscrapers and on fields

of restricted area, and will eliminate the costly and time-wasting hauls from air terminals on the outskirts. The attachment is geared so that it cannot be moved while the plane is in the air. At the moment of landing, a spring automatically releases a safety guard on the reversing control, allowing the aviator to bring his plane to rest on ground, deck or sea almost as instantaneously as a bird ceases its flight. Greater success in maneuvers with airplanes in connection with battleships and other vessels is seen as a result of the invention, and it will also prevent disasters in taking off. If the pilot realizes that his ship is not likely to make a successful ascent, he can brake and stop the plane by the reversal of the propeller. It is said, also, that the invention will bring nearer the general use of airplanes for suburb-to-city passenger service.

PROPELLERS TO PLAY "TUNES" FOR MECHANICAL BALLET

Industrial America deserves a special music as well as a special architecture, in the opinion of an eastern composer and, to that end, he has developed an odd assortment of instruments, some of which have never before been used for musical purposes. The equipment includes air-

Some of the Instruments Used in Producing Special Interpretative Music to Describe Modern Industry

plane propellers and apparatus for operating them, two octaves of electric bells and various other units. A demonstration of his "orchestra" was given in Paris and created a sensation among critics.

Stretcher in Use; the Chain at Ends of Handles Holds It When Desired Tautness Is Attained

TWO-HANDLED WIRE STRETCHER SIMPLIFIES FENCE REPAIRS

For taking up the slack in barbed, plain or woven-wire fences, or for tightening the wire at the posts, a two-handled stretcher now on the market is easily operated and affords strong leverage. On each handle is an automatic friction clamp and there is a chain at the bottom of the stretcher, the links fitting over the opposite handle to hold the implement in place when the desired tautness has been obtained. To use the stretcher, it is simply spread apart, the clamps attached to the wire and the handles drawn together, pulling the strand up so that it may be tightened by making a loop with a piece of extra wire and twisting it up, or inserting a splice. Keeping the wire taut is of importance, as it is said not only to prolong the life of the fence, but also to maintain it in efficient condition.

¶Nearly 70,000,000 pounds of artificial silk made from wood is used annually in the United States.

Mr. Pennock with Some of the Canes Which He Has Carved during His Spare Hours as a Hobby

CARVER HONORS HEROIC DOGS WITH UNIQUE CANE

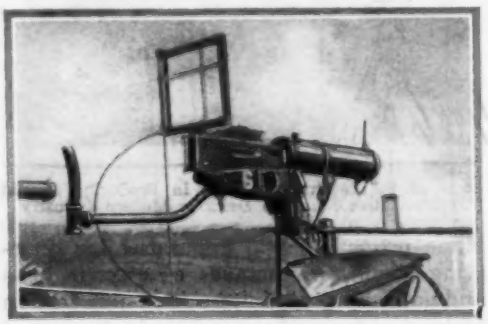
The memory of a brave collie dog that saved a regiment during the battle of the Argonne by relaying a message, and of other canine heroes, is preserved in a cane carved by A. J. Pennock of Detroit. He worked on the piece for more than 1,600 hours, carving the heads of several other famous dogs, noted for their bravery, as well as a number of prize winners of various breeds. Cane carving is Pennock's hobby, and his collection includes one representing the events occurring during Marshal Joffre's visit to the United States; another tells the story of creation, one represents the life of the frog, and still another Solomon's temple. Some of the designs are so minute that a microscope is needed to see all the details. He is now at work on a larger cane, or staff, six feet long, which will be decorated with more than 1,000 semiprecious stones. The craftsman has his workbench beside his bed where he can carve in quiet.

WILD ELEPHANTS PUT OUT FIRE IN INDIAN JUNGLE

How a herd of wild elephants extinguished a forest fire in Travancore, on the southwest coast of India, was related recently by laborers who witnessed the proceeding. A tree had fallen across the road and had been set afire to simplify the task of removing it. The blaze was slowly spreading to the woods near by when the leader of the elephant herd, apparently attracted by the odor of the smoke, appeared, trumpeted loudly to its companions and soon a band of dusky four-footed firemen were squirting streams of water on the blaze from their hoselike trunks. A stream near the road furnished the supply. The wondering natives, who had gone to a house a short distance away, watched the herd put out the fire and then drag the tree into the middle of the road.

SIGHT FOR ANTI-AIRCRAFT GUN LEAVES HANDS FREE

In order to leave the gunner's hands free to keep his piece trained on the target, a special sight has been devised for anti-aircraft purposes. It is set mechanically from a central control station, where all firing data are computed, and is laid to each of the four guns of a battery. When a plane is speeding at 120 miles an hour or so, each second is precious, and if the gunner has to stop to set his sight, the plane may speed out of range.



Mechanically Set Sight on Anti-Aircraft Gun, to Improve Accuracy of Fire at Moving Planes

The Hermit of Aurora, Last Living Settler in a Ghost Town That Boasted a Population of 8,000 Back in Civil War Days, and Now Stands Overgrown with Weeds

The Ghost Cities of the West

Gold Towns of Old-Time Rushes Dot the Southwest, Gaunt Reminders of Long Dead and Forgotten Miners

BACK in the little-frequented regions of California and Nevada are found picturesque relics of a colorful past; the skeletons of cities that seethed with life and activity one or two generations ago, but which now are silent and lifeless. It is a far cry from the old west, immortalized by Bret Harte, to the west of today, but only a few miles of dim roads separate trunk lines of tourist travel from some of these ghost cities which stand unchanged since "The days of old, the days of gold."

Mono lake lies at the eastern terminus of Tioga pass which leads over the mighty Sierras to Yosemite. Eighteen miles northeast of Mono lake stands the bulk of once famous Bodie, notable in western lore as the home of "the bad man from Bodie"—a character who, though sleeping under the sagebrush just outside the town, lives even to this day in slang.

The visitor to Bodie who has enjoyed moving-picture dramas of the old west will find something decidedly familiar in the appearance of its stores with false fronts, two-story frame hotels with full-length balconies and hitching posts conveniently placed. Passing through the broad main street, one looks in vain for signs of activity, the sound of voices or smoke from a chimney. But silence reigns supreme.

Broad plank walks, fast falling to decay, offer an insecure footing. Stepping carefully to avoid knot holes and projecting nails, one may enter the weatherbeaten buildings, inside of which the dust of many years lies thick and masses of cobwebs festoon the walls. Pausing for a moment amid oppressive silence, the question arises: What has happened to the tenants of all these buildings? The answer may be found in the last building on the street, a bank which guarded untold treasure

during the time of prosperity. With an optimism perhaps entirely without precedent, the owner of that bank still waits, hoping the roar of stamp mills may once more reverberate in the hills, and the heavy tread of miners' brogans again be heard on the deserted walks.

Bodie has a production record of about $50,000,000 in gold. Its passing was due to the "petering out" of some of the rich ledges and to ground water, which finally won the race with the pumps. During its heyday, Bodie had a population of 11,000 which has dwindled to barely two dozen. Not one store is doing business in the town, and it is necessary for the handful of inhabitants to bring in supplies from a considerable distance.

Twelve miles from Bodie, in Virginia Gulch, lie the remains of Aurora, Nev. During the Civil war that city had a population of 8,000; today a solitary hermit makes his abode there. Well-built structures of brick attest the fact that it was at one time a place of considerable importance. Under guidance of the hermit, one may explore the many stores and houses, wherein large numbers of interesting relics may be found—notes and other legal papers, letters, bills, and mining-stock certificates dated in the early sixties. During that time, Aurora was county seat of Mono county, Calif., and a two-story courthouse of brick was the pride of every citizen. Later, a survey showed the town to be seven miles across the Nevada line, and the county seat was changed to its present site at Bridgeport, far enough to the west to remove all doubt as to its being in the right state.

Situated a few miles east of Death Valley is Rhyolite, a ghost town which was built about twenty years ago, but which has since been completely abandoned. Conflicting stories are told of this district. Some say that there never was gold enough in the hills around the town to pay fair dividends on the stock sold. Others aver that gold in abundance remains untouched. An orgy of speculation took place here which has seldom, if ever, been equaled in the history of mining.

The death of Rhyolite was not preceded by a gradual decline as was the case with Bodie and Aurora. When the stock market broke, death was practically instantaneous. It occurred when the town was in its heyday, boasting a population of 10,000. Hundreds who had reckoned their wealth in stock, found themselves suddenly penniless. A large part of the population did not have sufficient means

Unchanged Since the Days of the Bad Man, Bodie Is a Page from a Picturesque Past, with Its Main Street Lined with Empty Buildings, Their Original Owners Long Since Dead

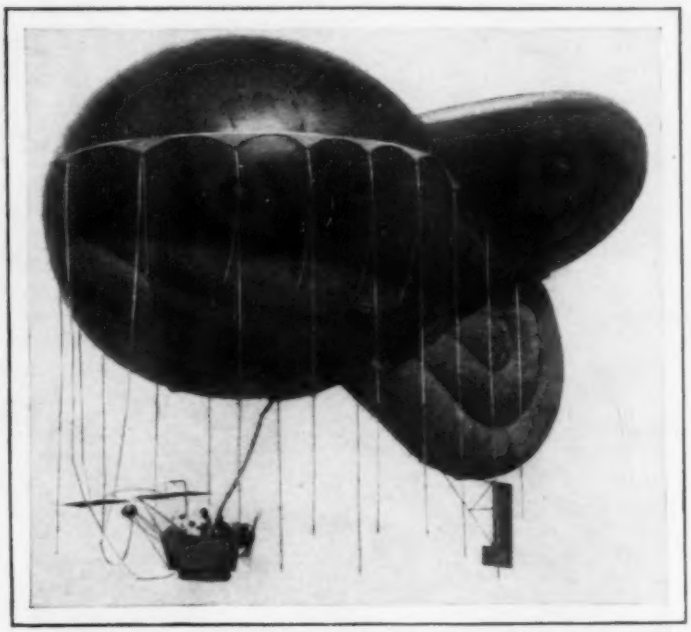
to purchase tickets to another section of the state, and many were faced with actual starvation. The railroad came to the rescue, and hauled trainload after trainload of penniless families out of the country on flat cars. In a comparatively short time Rhyolite did not have a single inhabitant, and desert vegetation reclaimed the main street.

The disintegration of the town has been hastened by wreckers and vandals, but the walls of the buildings will stand for years to come, monuments to the skill of the stock manipulator, and the faith of the investor. The only intact building in Rhyolite is one which is constructed of bottles. Steps have been taken to keep it in repair, for it is said to be the only one of its kind in the world.

An old smokestack, 175 feet in height, marks the abandoned mining camp of Belmont, near Tonopah, Nev. It was erected from bricks hauled by ox teams from Sacramento, a distance of over 500 miles, and is in as perfect condition today as it was when completed fifty-five years ago, when Belmont was a city of 7,000, made up of frenzied gold seekers. It was for many years the county seat of Nye county and was not entirely abandoned until 1905.

TINFOIL WRAPPING SALVAGED TO DECORATE HATS

Tinfoil and other fancy wrappings on gum and candies are being utilized for trimming hats in England. The pieces are worked into patterns of varying design, pasted to the hat and varnished to give a lustrous finish.



Part Balloon and Part Dirigible, This Odd-Looking Craft Is Used for Observation Purposes by the Italian Army

MOTOR BALLOON FOR ARMY USE SIMPLIFIES OBSERVATIONS

Equipped with a small motor and rudder, a balloon designed for the Italian army can easily be moved under its own power for short distances. This simplifies the task of changing positions during maneuvers. The apparatus is attached in place of the regular observation basket.

SUBMARINE DETECTOR IS USED TO TRAP THIEVES

Another instrument of war has been adapted to peace-time usefulness in the submarine detector, a microphone unit that registers vibrations. It is now being used in bank vaults, safes and in other installations. The slightest jar starts an electric current to sound an alarm or operate a visual signal or both, as desired. An advantage of the instrument is that it does not pick up sound waves and is so adjusted that false alarms are almost impossible, vibrations from the outside, such as those caused by trucks passing in the street, having no effect on it. The fact that it is entirely concealed within the vault likewise increases its effectiveness.

Perched on Its Narrow Pinnacle of Earth, After Street Graders Had Excavated Material around It; the Stranded House before Wrecking

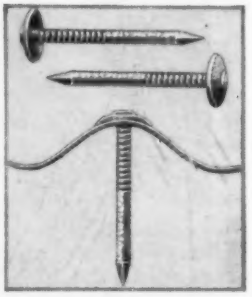
HOUSE IS STRANDED IN GRADING TO LOWER STREET LEVEL

Contractors engaged in lowering the grade of a street, to accommodate a new group of homes, were forced to cut around a house which was not removed when the work was started. The result was that the building was stranded on a pillar of earth, high above the new street level.

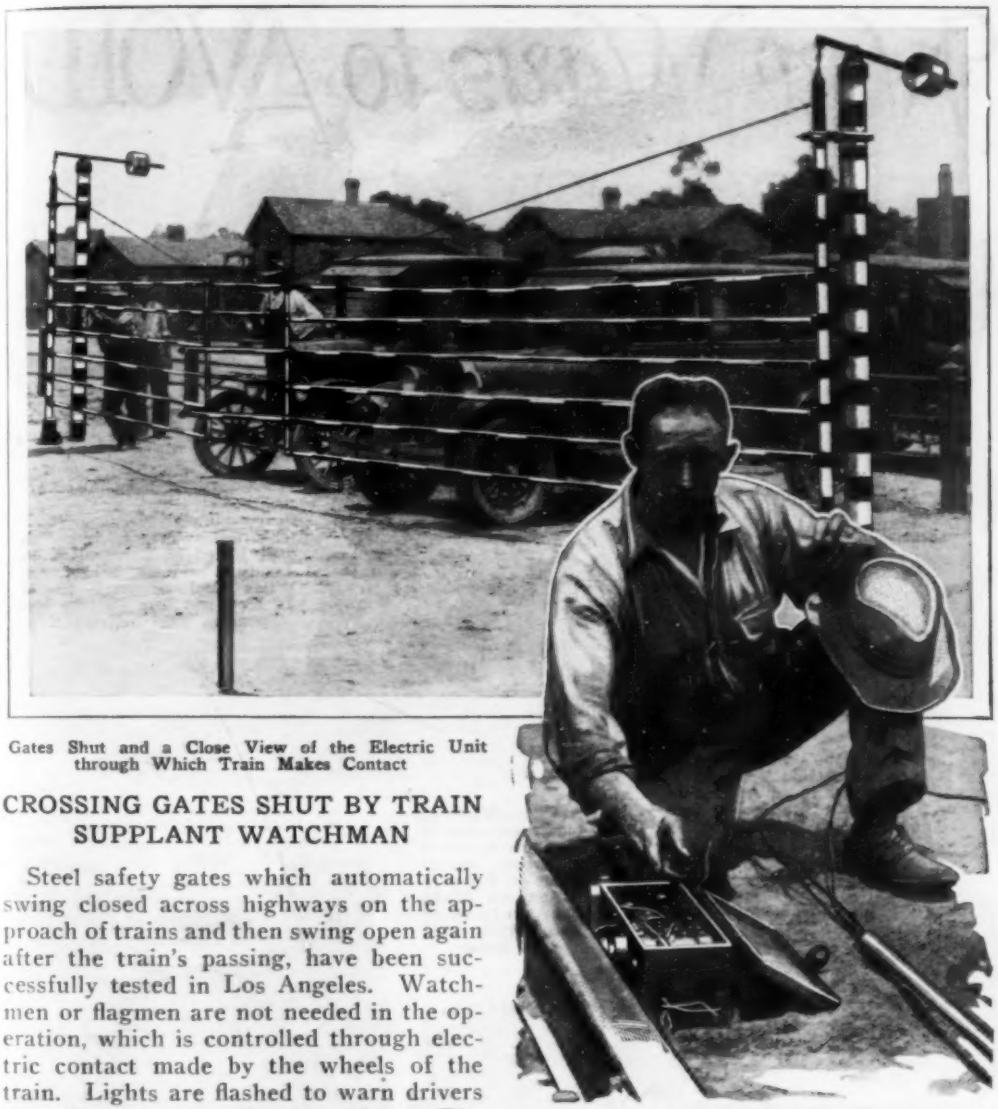
X-RAYS FIND CRACKS IN WOOD AND HOLES IN CHEESE

British army experts are testing the stanchness of their airplanes by looking for hidden cracks in the wood with the aid of the X-rays. An Ohio dairy farm has employed the same means to locate holes in Swiss cheese and, for some time, prohibition agents have been using a ray apparatus in hunting contraband liquor secreted in packages of merchandise. According to Dr. George L. Clark, founder of the Massachusetts institute of technology X-ray research laboratory, the rays are industry's latest aid, opening up new fields of invention and fortune and affording short cuts to various tests and findings with far greater accuracy than was possible with other methods. It was shown by X-rays, just recently, that spiders and silkworms spin exactly the same kind of fiber. The discovery has suggested the possibility of spider farms where quantities of the material might be produced and utilized in the manufacture of textiles. Stores are employing the rays to show customers how their feet fit in new shoes and a golf-ball maker is reported to have increased his sales by advertising the fact that he submits the spheres to a close X-ray test to prove the symmetry of the centers. Metallurgists declare they are on the road to a solution of the mystery of breakage in steel rails with the help of the rays, and the discovery of Illinium, the latest element to be identified, was made possible because X-rays revealed the character of hitherto unknown substances.

LEAKS IN ROOFING PREVENTED BY UMBRELLA-HEAD NAILS



Especially adapted for fastening corrugated or flat sheets of metal roofing, nails that have umbrella-shaped heads tightly seal the hole through which they are driven so that rain cannot enter. They are made of a single piece of metal and are galvanized or bright. Ridges under the head lock the nail.



Gates Shut and a Close View of the Electric Unit through Which Train Makes Contact

CROSSING GATES SHUT BY TRAIN SUPPLANT WATCHMAN

Steel safety gates which automatically swing closed across highways on the approach of trains and then swing open again after the train's passing, have been successfully tested in Los Angeles. Watchmen or flagmen are not needed in the operation, which is controlled through electric contact made by the wheels of the train. Lights are flashed to warn drivers that the gates are about to close. The cost of the installation and operation is said to be less than the ordinary wigwag systems, and the gates work satisfactorily should trains approach from different direction on different sets of tracks across the highway.

OLD PANS TURNED INTO MONEY WITH ENAMEL REMOVER

Tons of scrap steel are salvaged each year from worn-out enamel pots and pans cast on city refuse heaps, but the market value of the product has been impaired, owing to the presence of the enamel which interferes with the resmelting processes. This drawback is said to have been eliminated in a device an English inventor has introduced to remove the enamel. Old pieces are thrown into a hopper and pass through rollers which straighten the scrap into strips. In the operation, the enamel is broken off. It is sold for approximately $5 a ton for glazing tiles and for making glass and metal polish, while the cleaned steel commands from $10 to $20 a ton.

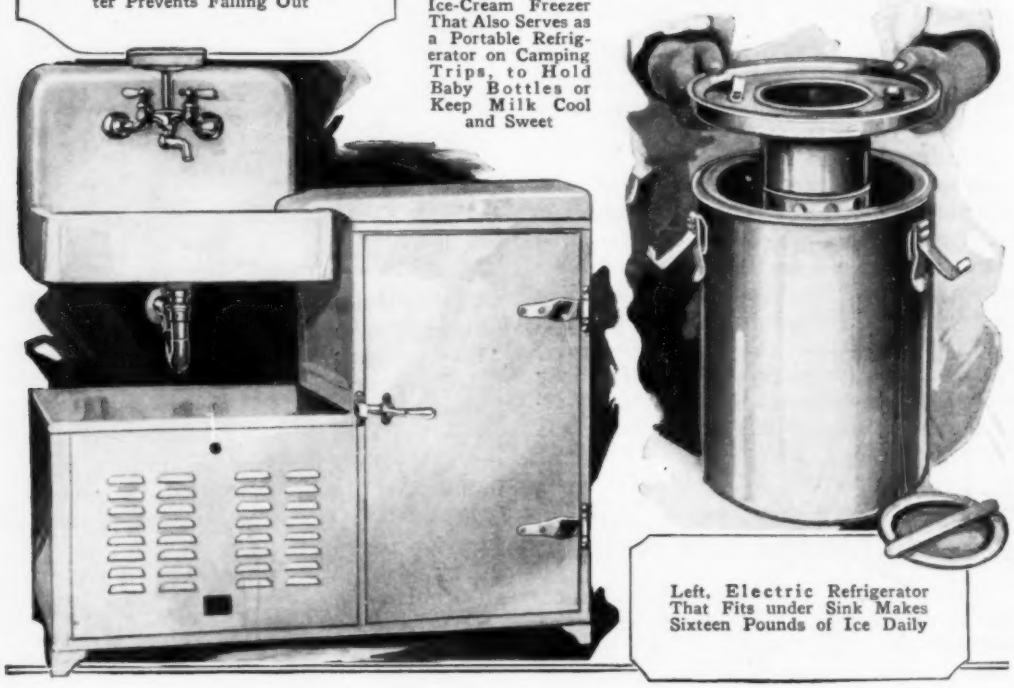
¶More lumber is used in California than in any other state.

New Ways to AVOID

This Glass Teapot, with Tea Ball Fitted in Cover, Has an Insulated Handle Which Remains Cool Although Liquid Is Hot, and Top Permits Expansion and Contraction

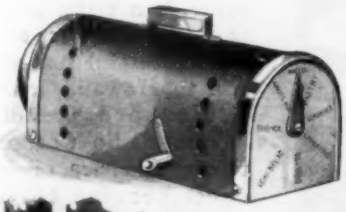
To Shield Baby's Eyes, Bassinet Has an Adjustable Top and Is Suited for Use in an Automobile or Outdoors; a Strap across Center Prevents Falling Out

At Right, Crankless Ice-Cream Freezer That Also Serves as a Portable Refrigerator on Camping Trips, to Hold Baby Bottles or Keep Milk Cool and Sweet



Left, Electric Refrigerator That Fits under Sink Makes Sixteen Pounds of Ice Daily

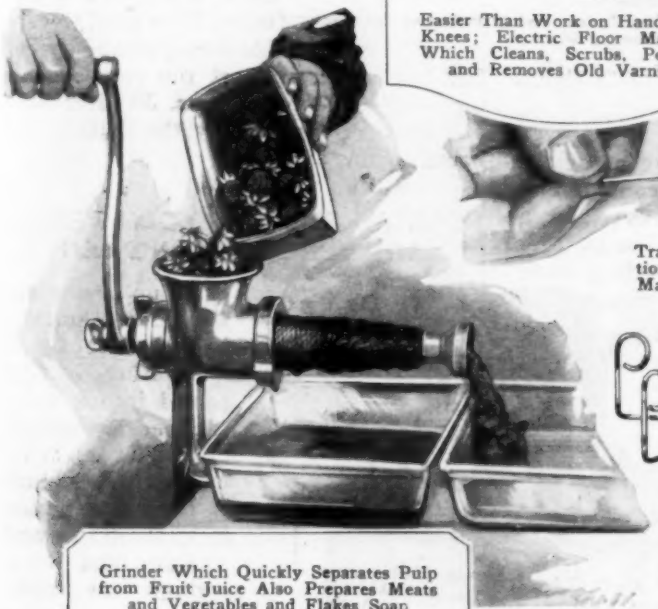
HOME Drudgery



Is Your Oven Hot Enough? This Alarm Can Be Set for Different Foods and Rings When Temperature Reaches Point to Start Cooking

Theft Protection and Reduction of Rattle Are Offered in This Lock, Which Secures the Window in Any Position and Is Easily Attached

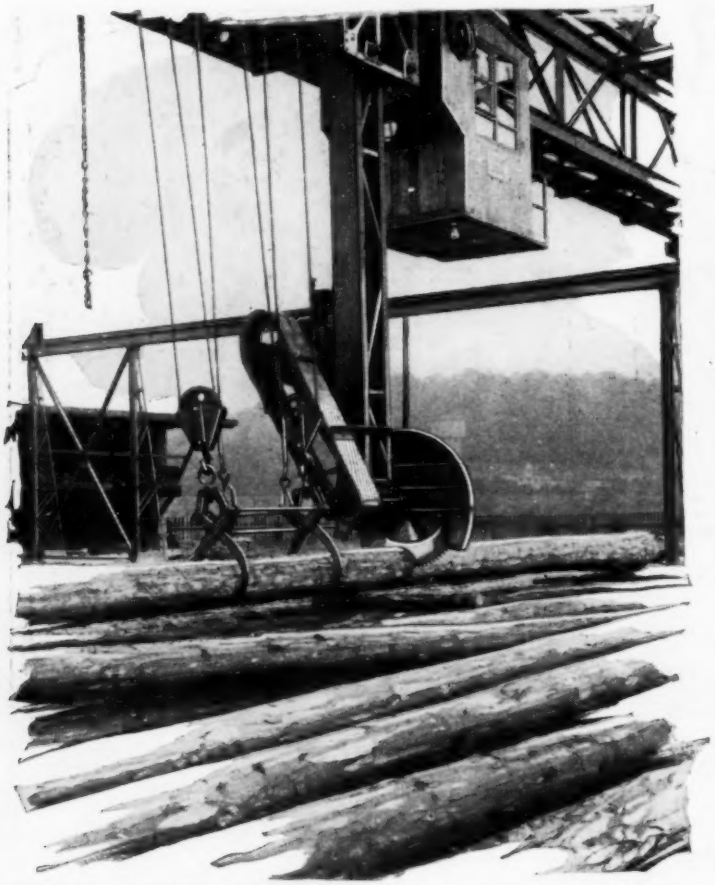
Easier Than Work on Hands and Knees; Electric Floor Machine Which Cleans, Scrubs, Polishes and Removes Old Varnish



Grinder Which Quickly Separates Pulp from Fruit Juice Also Prepares Meats and Vegetables and Flakes Soap

Transparent Needle Case Simplifies Selection of Right Size for Certain Work and Makes the Remembering of the Proper Numbers Unnecessary

Hanger, That Folds Up in Small Space, Holds Four Hats and Four Coats and Is Attached to the Wall with Two Screws



Circular Saw and Lifting Crane, to Speed Cutting and Handling of Logs at a European Lumbering Plant

CRANE AND SAWMILL COMBINED SAVE LABOR

Saving of seventy-five per cent of the labor bill is claimed for a combination electric saw and crane introduced at a European lumbering plant. The circular saw is fitted directly to the traveling crane proper and can be hoisted or lowered at will. Logs are handled by tongs and, as lengths are cut ready for sawing into boards, they are taken, a load at a time, to the saw frames. The crane is also used for loading and unloading cars.

Setting Up the Folding Bed; the Frame Can Be Locked, to Pull the Springs Taut

RADIO SERVICE TO PHILIPPINES

Airplane flights and wireless are connecting the United States to its possessions more firmly, so that isolation, in a sense, is a thing of the past. A few hours after the successful non-stop trip to Hawaii, Gen. J. G. Harbord, president of the Radio Corporation of America, opened direct service to the Philippines from New York. His message, sent by wire to San Francisco and thence through the air to Manila, almost halfway around the globe, was read, a few minutes after it had started, by Manuel Quezon, president of the Philippine senate, and Col. C. H. Nance, vice president of the radio corporation of the Philippines. The transmitting station at Manila occupies eight acres. Four steel towers, 165 feet high and spaced 290 feet apart, support the transoceanic antenna, while two others, 300 feet high and 700 feet apart, carry the marine and broadcasting antenna.

FOLDING BED HAS LOCK FRAME AND SPRINGS WON'T SAG

Set up or dismantled in a minute, a double steel bed and springs can be folded into a compact package weighing but thirty pounds. A feature is the lever which locks the frame and stretches the springs. One pound of pressure on this

unit is said to exert a pull of 1,000 pounds. When opened, the bed is forty-eight inches wide and seventy-six inches long. The single size is thirty-two inches wide.

ANNUAL LOSS BY HAILSTORMS OVER HUNDRED MILLION

Weather-bureau records show that more than 250 hailstorms occur in the United States every year, doing approximately $47,500,000 damage to crops alone. It is estimated that hail does more than $50,000,000 destruction in foreign countries annually, Germany, France and Italy being the chief sufferers. Tons of ice fell during a severe storm in Dallas, Tex., the damage there being more than $2,000,000 in broken glass, wrecked roofs and automobile tops. In 1925, hail losses for the state of Iowa were placed at nearly $8,000,000. Last year, the total premiums paid for hail insurance in this country amounted to more than $18,000,000 and the losses covered by such insurance were over $10,000,000.

HARROW MAKES SHORT TURNS ON ENDLESS TREAD

In addition to greater capacity and a saving of labor for the operator, a tread-drive tractor harrow introduced in Germany can make short turns, a great advantage in small fields or on plots where more than one crop is grown. The harrow units can be adjusted to do various grades of work.

For Short Turns in Small Fields, This Tread-Drive Tractor Has Been Found Successful

Policeman James O'Connell with the Camera Apparatus He Has Rigged to Take Burglars' Pictures

CAMERA TRAP FOR BURGLARS LATEST HOME PROTECTOR

To take a picture of intruders in the act of breaking into a house or other building, a New York policeman has rigged a camera attachment for a door in such a way that the burglar snaps his own photograph unawares. The instrument is concealed and the apparatus for making the exposure so arranged that it will be set off without fail at the forcing either of the door or of a window.

STRANGE FACTS ABOUT ODORS

While various chemicals, as prepared in the laboratory, have the strongest odors known, certain substances in nature are extremely pungent, the scent of the skunk, for instance, often being detected at a distance of a mile or more. Workers in chemical laboratories have been identified a block away from the odor of the materials clinging to their clothing. Camphor can be detected when diluted as much as one part to 400,000. One one-hundred-and-twenty-thousandth of a grain of oil of rose causes a definite stimulus to the olfactory nerves and one part of musk in 8,000,000 can be detected. Some investigators have launched the theory that odors, like sound and light, might be transmitted by radio, but this is considered impossible in view of the fact that the odor is caused by minute particles of the substance and not by vibrations.

WHAT'S LEFT for

The Army Fokker Which Flew to Hawaii, Showing the Radial Lines Painted on the Ship to Help the Navigator in Dead Reckoning, Aided by the New Sun Compass

By J. OLIN HOWE

THE fact that stands out in connection with this year's spectacular airplane flights across great sections of the earth's surface is that long-distance non-stop flying over thousands of miles of land and water has only just begun. Aviation has thrills in store for years ahead, until finally some flying genius completely circles the globe without coming down out of the air.

"This flight around the world in one hop is of course the shining mark for pilots to aim at," said Lieut. Leigh Wade, speaking of epic flights yet to come, after discussing with me his and Linton Wells' proposed aerial trip around the world in fifteen days. "Possibly it isn't as far away as you may think," the former war flyer continued, and his partner nodded confident agreement.

Wade was one of three army pilots to make the first air journey around our planet in 1924, by easy stages and taking altogether about six months; and Wells, a Tokyo press correspondent then, resigned after covering his assignment and stowed away in Wade's plane, where he rode until Washington ordered that he should be dropped.

"Longer air jumps, and still longer," Lieut. Wade said, "are more a matter of motor than of plane design. There is now in the shop an airplane motor for which the inventor claims about twice the duration of any in use. If this will do in a plane what it is said to have done in the laboratory, it will make possible a sustained flight of 12,000 miles.

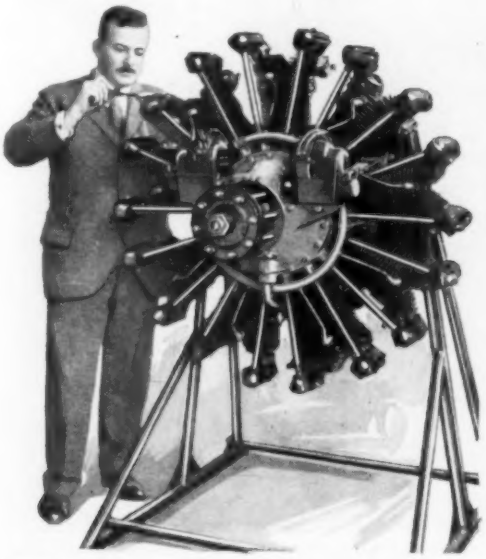
"That would mean," he went on, "flying clear around the earth if one started far enough north or south of the equator, but not by a practical route; and any flying feats which do not develop commercial practicability cannot possibly advance the cause of aviation.

"In fact, by flying around the earth on

AIR HEROES to Conquer

Lieut. Comm. Byrd Testing a Newly Improved Sextant, Which He Himself Designed for Aerial Navigation

the Arctic or Antarctic circle you could do it in under 10,000 miles; but to what purpose? You could even go to Spitzbergen, where Byrd took off in his memorable flight to the north pole, 700 miles away, and by some very nice navigation, fly around the globe on its parallel of latitude in about 4,000 miles. Or if it would be possible to take off much nearer the pole, the distance around could be cut away below that. But there is no practical route around the earth much less than 20,000 miles; and any such flight as those mentioned would be but a startling stunt, though it might add something to scientific knowledge.



Charles L. Lawrence, with His Famous Ocean-Crossing "Whirlwind" Motor

"Such a great flight as Byrd's to the north pole was purely for scientific purposes, as will be that he plans to make to the south pole next year, where there are thousands of square miles of unknown territory, taking off from New Zealand for the polar ice barrier at the beginning of the Antarctic spring in December and later flying from the barrier to the south pole. And one day some adventurous pilot will girdle the globe by way of the two poles, flying over each in turn—just for the sake of doing it!"

Meanwhile many more practical long-distance flights challenge the airman's prowess. At this writing, even the comparatively simple straightaway flight from New York to San Francisco, or Seattle, Spokane or Portland, Oreg., has not been flown, and there are other single hops between distant North American points well worth the flyer's effort—Chicago to Ju-

neau or Nome, Alaska, for instance, or Dallas, Tex., to Ottawa, Toronto or Montreal, Canada.

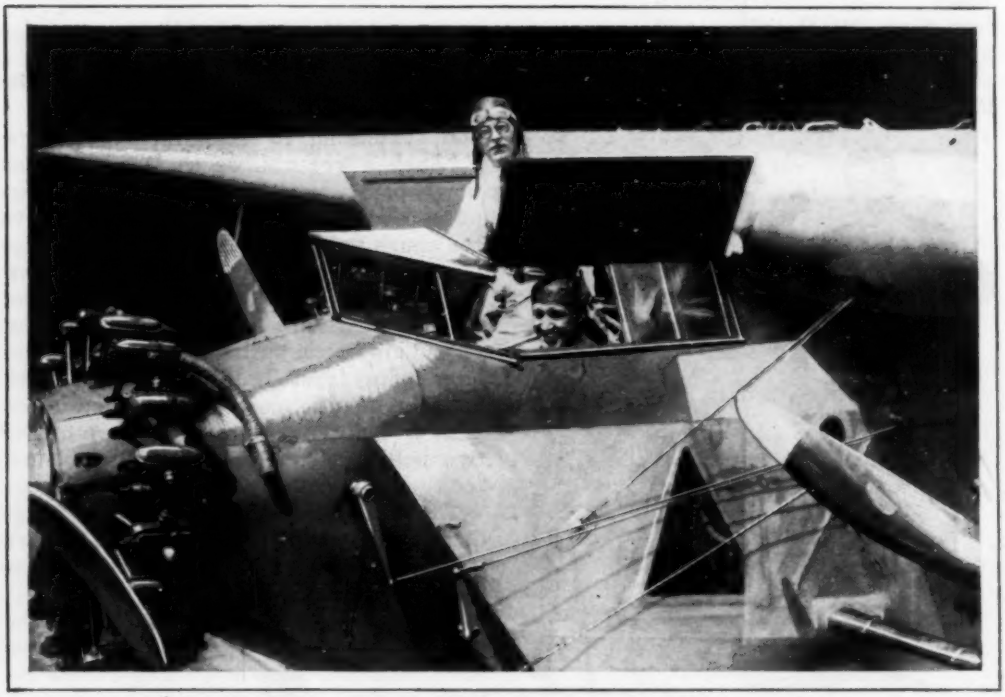
The possibilities of lengthy jumps across the Atlantic are far from exhausted, moreover. America to Mediterranean points, even to Constantinople, still tempts the capable pilot, as do America to Cairo, America to Sweden, South America to South Africa and so on.

Rene Fonck, French war ace, whose attempt to fly from New York to Paris last year ended in disaster before he got off the ground, was in Europe early in the summer and brought back four Rhone-Gnome-Jupiter motors to be put into a big Sikorsky plane which he has planned to fly across the Atlantic in September—possibly to one of the points mentioned. Besides, European flyers are to be reckoned with in return transatlantic hops—Paris to New York, England to Canada, Rome to America, and over other arcs of the earth's circumference.

And always the Pacific ocean intrigues the daring pilot. The San Francisco-Honolulu hop has been made—2,400 miles over blue water as against 1,700 to 1,800 miles over the ocean in a transatlantic flight, and without sleet storms—and perhaps some intrepid birdman soon will go on to Tokyo in a second leg across the Pacific.

Or this flight may be from Dallas to San Francisco, then to Honolulu and on to Hongkong with a stop at Guam or Manila, nearly 10,000 miles in four hops; this because of the rich prize hung up by the Texas city. There is also a chance that Leslie Arnold, of Los Angeles, may fly the non-stop round trip he has been planning from that city to Honolulu and return without coming down. And the Japanese may come through with a non-stop from Tokyo to America. Many lengthy transpacific hops beckon the aviator—such as San Francisco to Australia in, at most, three jumps, stopping at Honolulu and Samoa. This could possibly be done in two, for the airline distance from Honolulu to northern Queensland is not much over 4,000 miles, and there are numerous landing places on South Sea islands if the pilot is forced down.

Our present motors can readily do 4,000 to 4,500 miles and, under the most favorable conditions, might stretch this to 5,000.



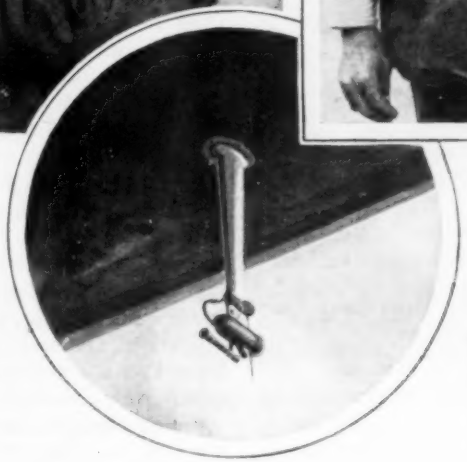
Lieut. George Noville, Radio Officer, Standing, and Bert Acosta, Seated, in the Pilot's Compartment, Just Back of the Center Engine of the "America" and in Front of the One Big Wing

The Radio Set That Kept the "America" in Constant Touch with the World throughout Its Long Flight; the Operator Wears a Soundproof Helmet with Built-In Earphones to Eliminate the Roar of the Three Giant Engines

With This Distress-Signal Gun and the Tubular Water Flare, Above, Byrd Was Prepared to Attract Attention Should His Plane Be Forced to Land in the Sea along Steamship Lanes

Unsinkable Suit and Water Still, Which Converts the Breath into Drinking Water, Above, and the Air-Speed Indicator's Suction Tube in the Circle at the Left

Comm. Adams of the National Aeronautical Society with a Sealed Barograph, One of Which Was Carried by Each Europe-Bound Plane to Record Altitude



Germany claims a motor which will fly sixty hours and a German airman plans to use it on a non-stop flight from Berlin over New York to San Francisco, a distance of about 6,500 miles.

And, in addition, our western hemisphere has other important flights.

Lieut. Comm. Byrd Paddling Ashore from a Navy Plane in a Rubber Life Raft; It Was This Boat That Saved His Entire Crew When They Landed in the Sea 200 Yards off the Coast of Normandy

Noville, Acosta and Byrd Inspecting Some of Their Instruments, Life-Saving Devices and Other Equipment

"If an American pilot—a civilian pilot, not an army or navy flyer; at heart the nations south of us are suspicious even of aviators in uniform—were to fly a non-stop from New York or Chicago to Mexico City, it would go far toward smoothing out relations between Uncle Sam and Mexico," remarked Lieut. Walter Hinton in discussing flights of the future.

Hinton piloted the "NC-4," first plane actually to cross the Atlantic, in 1919, and, since he left the navy, has flown from New York to Rio Janeiro via South American coast points and has also flown over thousands of miles of Brazilian jungle and wilderness with the Hamilton Rice expedition.

"A solo flight like Lindbergh's from New York to Rio would make a vast difference in the feeling of Latin America for this country," Lieut. Hinton said. "With the right seaplane, this distance of about 6,000 miles could possibly be flown in two hops, but available landing places for a land plane are very scarce en route."

When Comm. Byrd leaves in the early fall aboard the whaling steamer "Larsen" for the South seas, preparatory to hopping off, about December 1, for the south pole, he will encounter the world's worst flying conditions. Compared with his project of crossing the Antarctic ice barrier by plane, his trip last year over the north pole was

only a joy ride. For one thing, the Antarctic ice barrier is far larger than the northern ice fields, more difficult of crossing and infinitely more difficult of access. On the north pole flight the aviators were able to start from an old-established town, with their floating base lying at anchor off the shore, fly to the pole and come back to the same village again.

There are no towns in the southern hemisphere within striking distance of the pole, and it is difficult even to navigate a ship within a reasonable distance. Instead of the verdant summer vegetation of Eskimo land, the Antarctic is a barren wilderness, devoid of plant life and far colder than the north. It is guarded by a chain of mountains with sentinel peaks rising 10,000 to 15,000 feet into the air. The heavily loaded plane must rise high enough to cross them before it can set off across the vast snow-covered plain.

The north pole is in an ocean and to reach it Byrd simply flew over low and often level ice fields. The south pole is in the center of a vast and almost unknown continent. Here and there are open leads of water, such as those the whalers frequent south of New Zealand. There are nearly 400 miles of this ice barrier to be crossed south of New Zealand before the mountains that rim the plateau are reached. It took Amundsen and his men twenty-seven days to cover the 400 miles, traveling on skis with their supplies on dog sleds.

Amundsen climbed a glacier and crossed the mountains through a pass 10,600 feet high. The pole itself lies back of the mountains on the huge tableland, a perfectly level continent at a height of more than two miles above the sea.

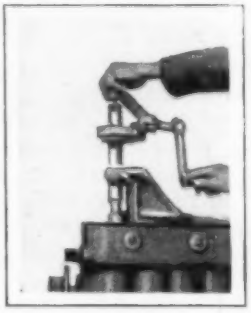
The more intense cold in the southern arctic is due to several causes, principally the high altitude and the absence of warming ocean currents.

Capt. Knight with Eagle Trained as Falcon; the Rack Helps Hold the Bird's Weight

TRAINING EAGLE AS FALCON REQUIRES FACE MASK

Falconry was practiced at least 2,000 years B. C. and is still followed in some sections as a hunting sport. Recently, Capt. C. W. R. Knight, a British naturalist, managed to teach a captured eagle to catch and retrieve game. The bird fought its keeper at first so that a face mask and heavy gloves were needed. In addition, a wooden rest was constructed to help support the eagle's weight.

MOTOR-VALVE SEATS RENEWED WITH SIMPLE CUTTING TOOL



To recondition the valve seats in motor blocks, a hand-operated cutter quickly countersinks the old seat around the top, where it is likely to be worn, cracked or burned, permitting the insertion of a semi-steel ring. The tool is easily adjusted and is provided with five cutters to fit 117 makes of motors.

Steichen, and Typical Pattern Designs Made by the Shadows of Tacks; Strong Lights Are Arranged to Create the Angular Forms

SHADOWS ARE CAUGHT BY LENS FOR NEW DESIGNS

With the ever-changing trend of the present-day fashions new creations are constantly being sought after. The latest development for acquiring distinctive designs is by photographing shadow patterns created by many objects. Tacks furnish many interesting detail effects, while matches, cigarets, moth balls and sugar lumps attain equal honors for variety. These objects are carefully mounted on large white boards and arranged according to the effect desired. Powerful side lights are fixed in various positions until a perfect dark and light shadow effect is obtained. By using lights of varying intensity the shadows acquire different values. This process of creating pattern designs has been developed by Mr. Steichen, who has spent a lifetime in photographic work. After the photographs are completed they are taken to the mills where the cloth is made and stamped with this novel effect which was obtained from a tack or sugar-lump pattern.

MADE-TO-ORDER AIR PROTECTS ART IN MUSEUM

To keep all masterpieces from warping and cracking, the Toledo art museum has been fitted with special heating and ventilating apparatus so that the "weather" inside the building can be kept at the proper temperature and humidity at all times. The importance of these precautions is greatest with respect to many of the most costly paintings, some of which were made on wood backs, subject to buckling and warping that might easily prove ruinous to the work. For instance, Raphael's "Madonna of the Chair" is on wood, supposedly the head of a barrel. In summer, it expands in its frame and, in winter, contracts. "Cradling" the backs of paintings on wood has been tried in some museums to protect them. This is accomplished by vertical struts of wood reinforced by horizontal pieces to absorb the various reactions of the picture to the changes in atmospheric conditions. By treating the air that goes into the museum, dust is also extracted, so that there is less damage to the displays. At the Metropolitan museum in New York, installation of weather-making apparatus has been helpful in protecting the large collections of furniture from harmful drying and swelling at different seasons.

Building a Six-Foot Loud Speaker

By MYRON L. HARMON

THE exponential type of horn, when used with a good loud-speaker unit, leaves little to be desired as regards volume or faithful reproduction. This horn is not a new or revolutionary idea, but represents a well-tried principle. Any good radio store can supply you with factory-made horns of this type, but this article is intended for those who desire to construct their own with the resultant saving in cost.

It may be said without reservation that anyone can build this horn and do a very creditable piece of work without the aid of tools of any kind, and should any mistakes occur, they can easily be corrected with no loss of efficiency.

It is well at this point to pause and picture to oneself the work to be done and the results desired. The work will consist of filling a canvas or muslin bag with sawdust, to serve as a model, and the making of a plaster-of-paris cast from this model, both very simple operations. Various other ideas will occur to the experimenter as to ways and means, but only the one method will be considered. The completed work will be a horn, 6 ft. long, with an opening at the larger end measuring 20 in. in diameter, the horn being wound into a shape much resembling the large tuba of the brass band. Being made of a comparatively vibrationless material, it possesses splendid tonal qualities.

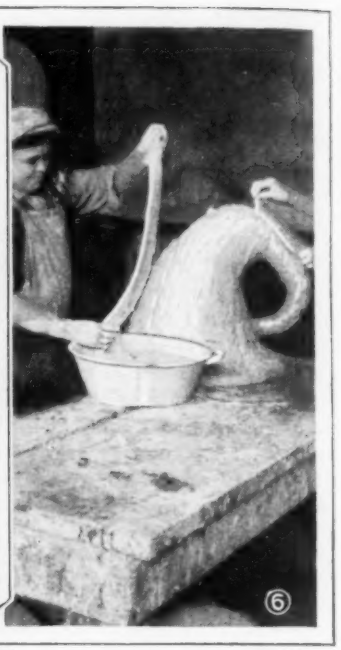
We will now take up the actual construction by laying out the pattern on the cloth. Obtain 2 yd. of a good grade of muslin at least 65 in. wide, or 4 yd. half as wide. By referring to Fig. 1, you will see that the model or core consists of a conical sack which measures ¾ in. in diameter at the small end, and tapers to an opening 20 in. in diameter. Of course, in laying out the pattern (see diagram page 651), we are interested in the varying circumferences rather than the diameters and, since the muslin tube is made in two pieces, the drawing dimensions indicate the half circumferences at points 6 in. apart; the dimensions given, while not mathematically correct, are sufficiently accurate for practical purposes. There may be some who wish to first lay out a paper

Completed Core Sack Ready for Filling and Wooden Disk for Closing End

Sack Filled and Ready for Clay Covering; Left, How the Clay Coating Is Applied

Applying Water with Brush to Obtain Smooth Clay Surface; Note Method Used for Supporting Small End to Prevent Coils from Touching

Applying First Plaster-of-Paris Coating by Throwing Motion of the Hand; the Entire Surface Is Coated in This Manner

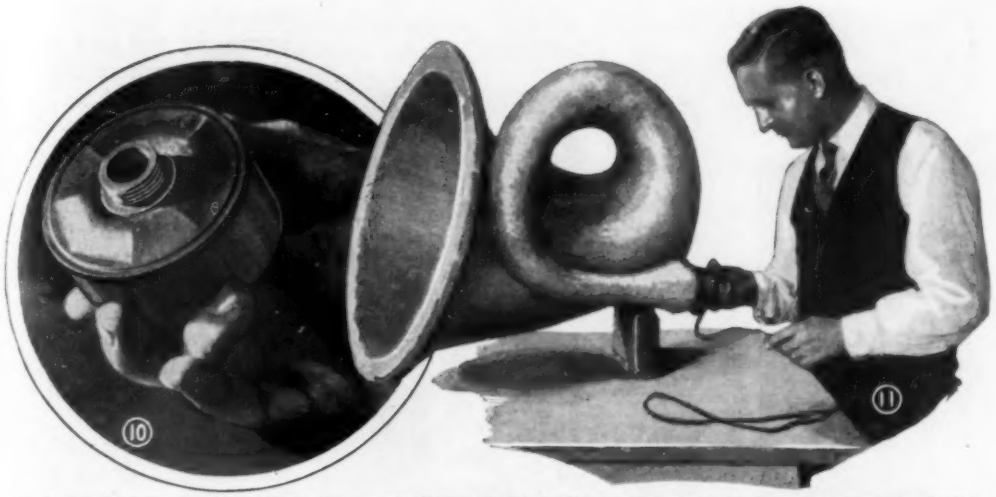


Applying Strips of Burlap or Hemp Soaked in Plaster of Paris, to Add Strength and Thickness to the Wall

Completed Casting, Showing Small Coil Joined to Large Section; the Rope Extends beyond Mounting Point for the Loud-Speaker Unit

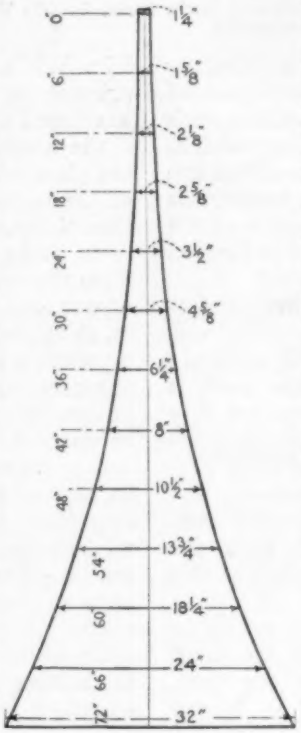
Removing Wooden Disk and Detaching Core from Plaster Wall; the Sawdust Is Now Loosened and as Much of It as Possible Is Removed

Pulling the Rope to Withdraw the Sack; the Clay Clinging to the Wall Is Then Washed Out with a Hose



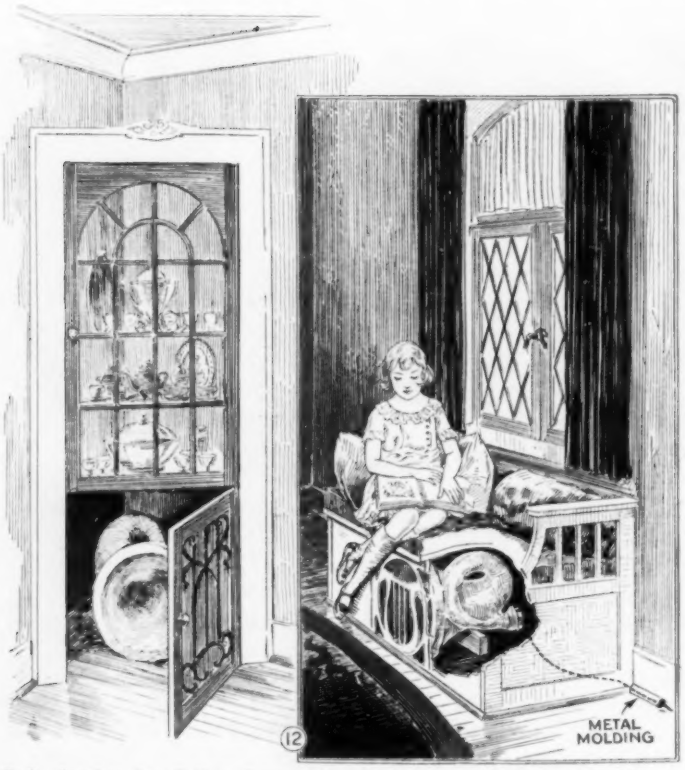
Left, Type of Loud-Speaker Unit Suggested, Which Is Easily Mounted in a Small Brass Bushing, or Sealed in Plaster in the Position Shown in the Photo at Right

pattern and this is not a bad idea, but do not forget to allow enough material for the seams on each side. It would be well also to add about ½ in. to the diameter of the large end for a distance of about 1 in. This will take care of shrinkage and allow a better fit of the front board, which will be mentioned later. Assuming that the cloth has been laid out on a long bench or on the floor, doubled, of course, and securely tacked, the pattern marked and the figures checked, there are only the cutting and sewing to be done, and we have the funnel-shaped sack which, when filled with sawdust, will provide the necessary form for casting. Turn the bag inside out so that the seam edges are on the interior and, in order to prevent the sawdust from becoming water-soaked and to keep the sack from clinging to the plaster, dip the sack into an ordinary cooking pot in which about two bars of paraffin have been melted. As soon as the paraffin has come into contact with all parts of the bag, remove it quickly and with someone's aid pull it back to its original shape, eliminating as many wrinkles as possible and separating the surfaces which have a tendency to stick. Sometimes the latter may be accomplished by blowing into the small end, thus forcing the bag into shape.



The front board which is used to close the large end of the form to prevent the sawdust from escaping is now fashioned, either from a large single board, about ⅞ in. thick and 20 in. wide, or from a built up and cleated piece. A circle, 20 in. in diameter, is scribed on the wood and sawed out with a band or scrollsaw. Most lumberyards and mills have bandsaws and they will do this work at a very small expense; of course there is nothing complicated about this operation and the builder can easily do it himself. If the sawing is done on a bandsaw or even otherwise, the edge should be beveled to conform with the contour of the pattern at this point. A large hole is then drilled through the piece for use in pouring the sawdust, and a cork of proper size is provided to close this aperture.

Other materials required are about 20 lb. of plaster of paris, about ½ bbl. of sawdust, a piece of rope, about 8 ft. long and ½ in. in diam-



Left, Speaker Installed in Lower Compartment of Colonial Corner Cabinet; the Grill Cut in the Door Is Backed with Gold Cloth; Right, Built-In Window Seat Installation

eter, some pieces of burlap sacking or Philippine hemp, such as is sometimes used for packing glass, and 2 or 3 lb. of clay, such as school children use for making models. It will be noticed that exact quantities are not specified because different individuals will use more or less and it matters little just how much material is used so long as the necessary strength is obtained.

It is well now to call for a little assistance from some one, say, a strong boy. Provide both him and yourself with old clothes, or overalls; not that the work is so terribly dirty but more enjoyment may be had and better results obtained if the builder's mind is not occupied with preventing a few spots on his wearing apparel. Pass the rope through the cone so that it protrudes 1 or 2 in. from the small end and tie the sack securely at this point. Fill the sack with sawdust to a point about halfway up and, by means of a long stick, tamp it down into the small end, being careful not to tear the cloth. If the small end does not fill easily, try working it down by squeezing the sack along the points where the difficulty appears. The front board is now inserted, with the smooth side out, the edges of the cloth tacked on and the remainder of the form filled. As soon as the bag is reasonably full insert the cork. The result of your labors should now resemble a 6-ft. horn filled with sawdust and closed at both ends.

Place the form with the front board down on a large flat surface and curve the small end around as tight as consistent with the strength of the fabric. Tie the model in this position by running strings to other objects or walls. Care must be exercised here to prevent the different sections from touching, and it is well to separate them by a space of about 2 in. While the paraffin on the bag should prevent the core from sticking, the writer has found that better results are obtained if the whole form is covered with modeling clay, which also will give the interior of the completed horn a smoother finish. One object must be borne in mind and that is to make the bag as easily removable from the cast as possible. Apply a coating of wet clay to the entire surface, about ⅛ in. thick, fill all wrinkles so that the form presents a smooth, uniform and graceful appearance and eliminate any straight lines in the design. An old soft brush dipped in water will serve to smooth the clay.

Procure an old dish pan and fill it about half full of water; stir the plaster into this, by adding a handful at a time, until the mixture has about the consistency of good cream. There is no better tool for this purpose than the hands and, as the plaster is easily removed, there is no objection to using them. Larger vessels may be used for mixing the plaster, but care must be exercised that it does not harden faster

than it can be applied. Several panfuls of the mixture will be required. Apply the mixture to the form in handfuls with a sort of throwing motion, seeing that all surfaces are evenly covered to a depth of about ½ in.

It is here that the pieces of burlap or hemp come into play. Soak them in the mixture and apply to the plaster so that all parts are again covered. A sort of wrapping process can be used on the small parts, still taking care that the sections do not touch on the turns. The burlap adds much to the strength.

A small brass threaded nipple to receive the loud-speaker unit might be set in the tip of the horn at this point, but this can be easily done after the horn is completed and will not be mentioned again.

Add more plaster, until the whole surface is covered by about 1 in. Fill in the space between the turns so that the whole is one solid mass of plaster. With a piece of burlap go over the horn and smooth off. Allow the plaster to set about 10 or 15 minutes, or until, when tapped with the knuckles, it presents a fairly hard surface; of course it will not be entirely dry, but this is not desired at this time.

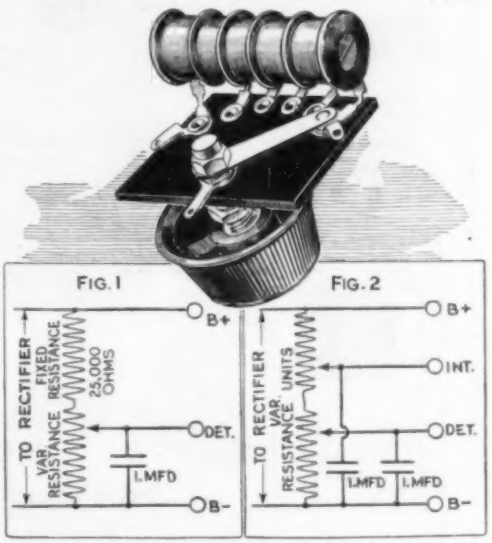
Get a good grip on the horn and pull out the front board allowing as much sawdust to escape as possible. Pull the rope out of the horn. Some of these operations require considerable force, but the builder will be surprised at the strength of the horn, and unless it is dropped, it will stand a good deal of abuse. Use a long heavy spring or a rod to loosen as much of the filling as possible, and pour it out.

Pull the sack out; this will require considerable force due to the snubbing action on the turns. Do not be alarmed if it does not come out easily, because there is a simple expedient. The binding will probably occur at the turn in one of the smaller sections. Locate this point as nearly as possible and, with an ordinary saw, cut out a section of the horn by V-shaped incisions. Probe around here with the rod or spring, and after the sack is loosened, replace the segment which was sawed out and cover with burlap and plaster as before. No ill effects will be noticed from this operation.

With a garden hose, wash out all remnants of clay that may have lodged in the smaller turns; let the horn dry and attach a good loud-speaker unit. You will be amazed at the volume and tone that will gush forth and will have an instrument of which you may be justly proud.

Tapped Resistance Unit for B-Eliminator

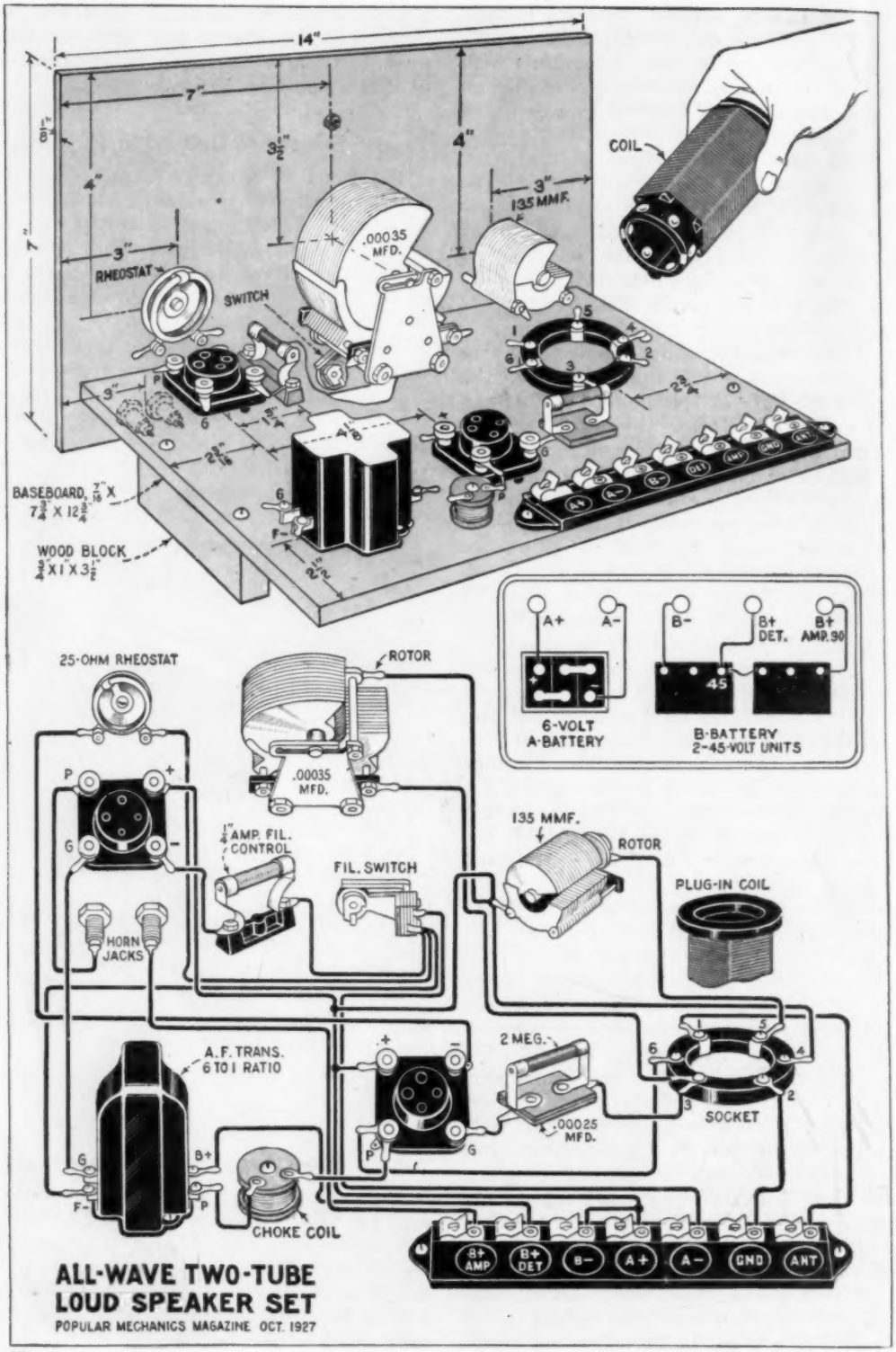
The illustration shows a tapped resistance unit especially designed for B-eliminator use. Fig. 1 shows how the unit is used to regulate detector-tube voltage. When a fixed resistor of 25,000 ohms is connected in series with the tapped unit, and the voltage from the rectifier is 135, then the range covered by the tapped unit will be 14, 15, 24, 27, 33, 37, 41, 45, 48 volts approximately. If the rectifier voltage is 185, the range will be 20, 22, 33, 36, 43, 47, 52, 57, 60 volts. Wherever the rectifier voltage exceeds 200 volts, the fixed resistor used in series should be 50,000 ohms instead of 25,000. Fig. 2 shows two tapped units used to regulate both detector and intermediate voltages.



Resistor Having Several Taps to Obtain Various Voltages for B-Eliminators

Auto-Timer Cable for Battery Leads

A discarded Ford timer cable may be used for battery leads or for bunched leads in receiver construction. A suitable length can be cut and connecting lugs soldered on at convenient points; these lugs will be found on the old cable and may be used again as desired.



ALL-WAVE TWO-TUBE LOUD SPEAKER SET

POPULAR MECHANICS MAGAZINE OCT. 1927

Two-Tube Set Works Loud Speaker

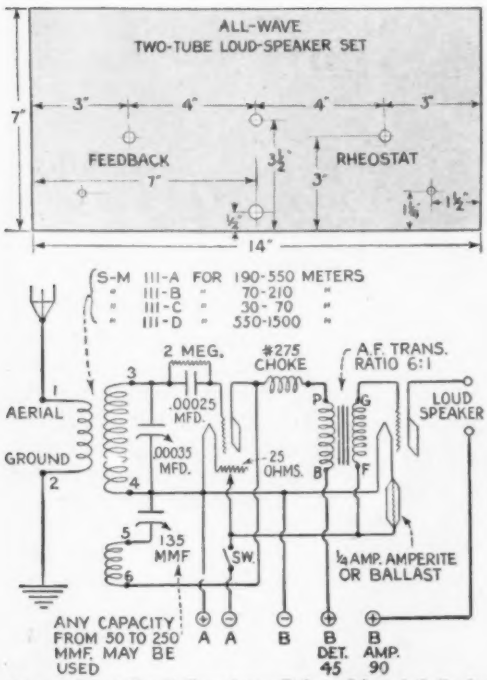
By FRANK L. BRITTIN

THIS two-tube receiver will not only work a loud speaker but has the additional advantage of covering a range of wavelengths between 30 and 1,500 meters by means of plug-in coils. By its simplicity the set appeals to the beginner, while the wide range possible without change in circuit and the low cost make it attractive to all. As built in Popular Mechanics radio laboratory, the set produces a loud-speaker volume on local stations equal to that obtained with the average three or four-tube set. The parts cost about $21, allowing $6 for the a.f. transformer; the plug-in coils are $2.50 each, additional, and may be selected to cover the wavelengths desired, with the exception of the coil tuning from 550 to 1,500 meters, which costs five dollars.

Either standard or dry-cell tubes may be used, but best results will be obtained with the large tubes. For dry-cell tubes, a filament-control unit suitable for this type and three dry cells connected in series for the A-battery should be used, no other change being necessary. The sockets should be of the new X-type and it is desirable that they should be spring-suspended, especially the one for the detector tube.

The front panel and baseboard layout are shown at the top on the opposite page, the arrangement being very simple. The wooden baseboard is supported by two wood blocks, ¾ by 1 by 3½ in. The front panel is screwed to the baseboard at front, the filament switch and the horn jacks being located below the baseboard. A simplified wiring diagram is given below and also a separate diagram showing the battery connections. Flexible rubber-covered hookup wire is used for the circuit, and holes are drilled in the baseboard so that the various leads may be run as direct as possible. The photo giving the rear view of the completed set shows that very little wiring appears above the baseboard. The schematic diagram of the circuit, with the front-panel template, on page 656 also gives a list of the various coils suitable for the set.

Use soldering lugs under each terminal, and solder all connections securely. Note carefully the rotor connections of both

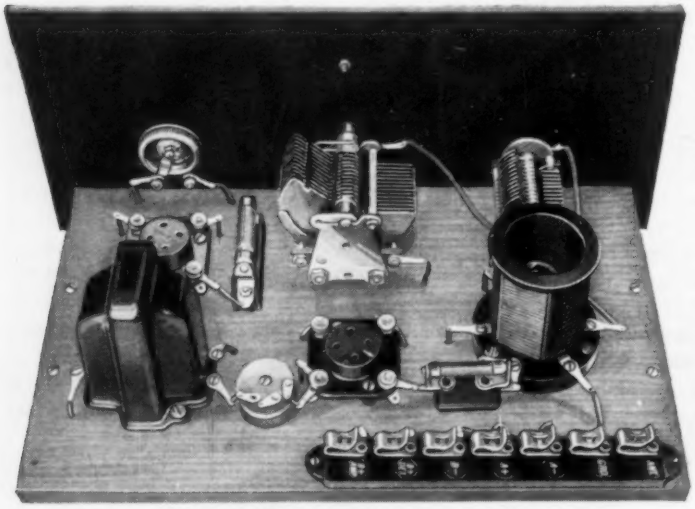


Above, Front-Panel Template; Below, List of Coils for Various Wavelengths, and Diagram of Circuits

variable condensers, and make all grid and plate leads as short as possible, being careful not to run them parallel at any point. The rheostat controls the detector tube only, while the amplifier-tube filament is automatically controlled by a ballast or amperite and a ¼-amp. type is used for the standard 201-A tube. The choke coil between the plate of the detector tube and the P-post of the a.f. transformer is not absolutely necessary, but is advisable for best results. As a set of this type can be used for the short-wave broadcasts, it should be popular in warm damp localities where heavy static prevails on the longer wavelengths. In such localities, use a grid condenser of the bakelite-covered type and keep the set as dry as possible. A simple method of keeping the set free from moisture is to mount a plain porcelain socket at some convenient point in the cabinet and wire it to the house lighting supply, burning a 60-watt mazda lamp a few hours a day. This idea has been suggested to many of our readers in the Canal Zone with excellent results.

After the wiring has been completed, connect the batteries and place one tube successively in each socket to test the filament circuit; if the tubes light as they should, the set is ready for operation.

Use a one-wire aerial, about 75 ft. long, or not over 100 ft. including lead-in and ground. For the regular broadcast programs between 200 and 550 meters, the 111-A coil is all that is required; plug the coil into the socket provided for it, making sure that all contacts in the socket engage with the metal contact bosses on the base of the coil mounting. Turn on the filament switch and rotate the dial of the large variable condenser, keeping the plates of the small condenser about half out; then slowly turn up the filament rheostat until a slight hissing is heard. Continue to rotate the large condenser dial until a station is picked up, and finally readjust the small condenser to the point where the volume and clarity of the signal are at maximum. Once the small condenser is adjusted, it will not be necessary to readjust it for every station; merely rotating the large condenser dial will bring in one station after another. Keep the detector rheostat at the lowest point consistent with good re-



Rear View of the Completed Set, Showing Simple Arrangement of Parts

sults; burning the tube filament higher than necessary does not improve the signal and greatly shortens the effective life of the tube. Stations, once logged, can be found again at the same dialing, and with a little practice distant stations can be brought in, on silent nights when weather conditions are favorable, with remarkable volume for a two-tube set. When selecting a loud speaker, do not expect to get first-class results with a small cheap speaker. The better the speaker, the better the results with any type of set.

A large detailed blueprint of the wiring diagram and layout may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents. Specify blueprint No. 122.

MATERIAL LIST

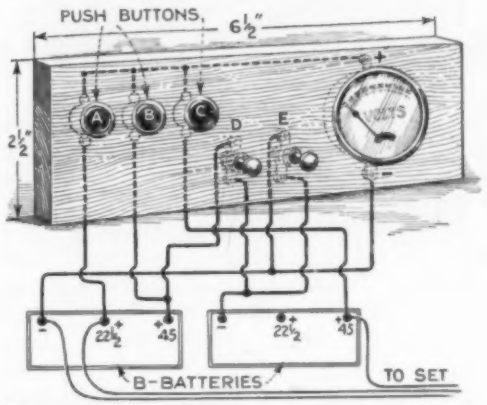
1 front panel, 3-16 by 7 by 14 in.
1 baseboard, 7-16 by 7¾ by 12¾ in.
2 wooden blocks, ¾ by 1 by 3½ in.
1 25-ohm rheostat.
1 .00035-mfd. variable condenser.
1 135-mmf. variable condenser, or any capacity from 50 to 250 mmf.
1 filament switch.
1 a.f. transformer, 6 to 1 ratio.
2 X-type spring-suspended sockets.
2 cord-tip jacks.
1 automatic filament control, ¼-amp. type for 201-A tube.
1 S-M choke coil, type 275.
1 S-M coil, type 111-A, B, C or D.
1 S-M universal coil socket.
1 grid condenser, .00025 mfd., with gridleak clips.
1 2-meg. gridleak.
1 spring binding post strip, or single Fahnestock clips.

New Kit for Browning-Drake Set

A new kit of tuning units manufactured by the Browning-Drake corporation for the set described in the September issue of Popular Mechanics is now obtainable. Mr. Glenn Browning, the designer, has made a slight change in the antenna coil, which now consists of 56 turns. The National kit may be used in the same manner, provided the corresponding coil is increased to 56 turns. The B-D foundation unit consists of engraved panel and subpanel, sockets, resistor clips, soldering lugs, machine screws, nuts, bolts and wire; this additional unit makes it very easy for the builder to obtain the correct materials specified by the designer.

Making Loop Connections

Where it is practical to make a loop connection at a terminal, care should be taken that the loop end of the wire that is placed around the binding post follows the screw thread. Most binding posts are threaded with a right-hand thread, the cap or nut being tightened clockwise. Form the loop over a machine screw or use a small pair of wire-forming pliers, bending the loop in a clockwise direction so that, when the nut or cap is tightened, the wire will not be twisted out from under the nut, as would be the case if the wire and nut turned in opposite directions.



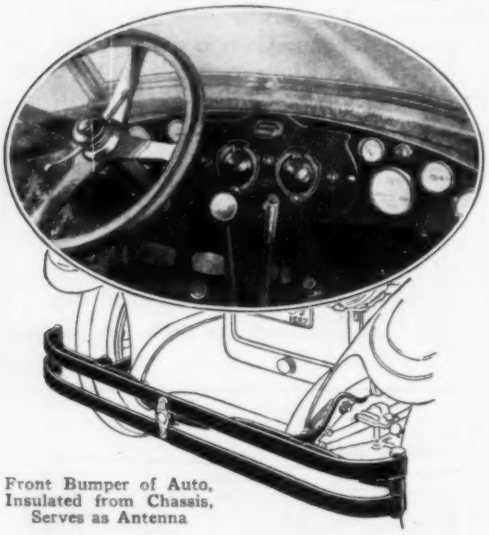
Wiring Diagram Showing Test Board Connected to the B-Batteries and Location of Apparatus

Handy B-Battery Test Board

A handy test board for B-batteries, that may be left connected without interfering with the operation of the set, is shown in the illustration. The materials required are three small push buttons, two push-pull filament switches, a small d.c. voltmeter, reading up to 50 volts, and a board ½ by 2½ by 6½ in. in dimensions. The sketch shows the construction in detail and the board is mounted in the cabinet. For testing the 22½-volt tap on the first battery, press button A, and button B for the 45-volt tap. To test the second B-battery, close switch E and open D, then press button C. When the set is in operation, close switch D and open E.

Bumper Serves as Antenna

Good reception has been obtained by converting the front bumper of an automobile into an aerial. This is done by inserting laminated strips of bakelite insulation between the bumper and chassis. The lead-in wire from the bumper runs to a receiving set mounted on the instrument board, as shown in the photo. The loud speaker can be placed in any convenient position. The location of the receiver on the instrument board has been found handy, as the driver can readily tune in.



Front Bumper of Auto, Insulated from Chassis, Serves as Antenna

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Selection and Care of Storage Batteries

The lead-acid storage battery is still with us and as far as the radio receiver is concerned it will likely remain for some time. It is necessary to take just as much care in selecting the storage A-battery as any other part of the equipment. There are good and bad types, and a big storage battery will often hide a lot of worthless junk. Therefore, it is usually best to consider the reputation of the manufacturer, as he is just as anxious that you have a good one as you are. In the average storage battery there are three hard rubber, or glass cells, containing lead plates and diluted acid; the more plates the larger the cell capacity and the longer the charge will last. There are a number of positive and negative plates in each cell, the positive plates being made of lead peroxide and the negative plates of spongy metallic lead. When the cell is charged, the positive plates take on a reddish color. Certain chemical actions taking place inside the battery make possible the use of a graduated, floating gauge, known as a hydrometer, for determining the state of charge, or condition of each cell. During discharge, the active material in the plates is changed to lead sulphate, which gradually covers the surface of the plates and finally the current ceases to flow. It then becomes necessary to reverse the action with the aid of a battery charger, clearing the plates of the sulphate and permitting the acid to again circulate freely. The acid is not lost in this process, but the water evaporates and must be replaced as required to keep the level of the electrolyte at least ¼ in. above the top of the plates at all times. The acid content is about 20 per cent of the full volume, and nothing but distilled water need be added. Any acid solution deposited on the top of the cells by spraying during the charging operation should be immediately removed with a cloth dampened with household ammonia. This neutralizes the acid and prevents any leakage paths between the cells due to corrosion. Batteries that have been allowed to remain in a discharged condition will often display an accumulation of greenish corrosion around the positive terminal; this should be carefully scraped off and the terminal covered with vaseline. It is well, too, to apply vaseline to the terminals of a new battery to prevent corrosion, which is decidedly bad for the battery as well as the connecting wires from the battery to the set. Before recharging a new battery, see that the vent holes in the top of each cell cap are open.

SIXTY DOLLARS BUILDS NINE-TUBE SUPERHET

A HIGHLY efficient nine-tube superheterodyne receiver of advanced design that can be built for $60.00, just half the cost of any standard superheterodyne, yet in which nothing has been sacrificed to economy, will be described in next month's Popular Mechanics. Built and thoroughly tested in our radio laboratory, this instrument has proved fully equal to any superheterodyne previously developed, in range, selectivity, volume and tone. Watch for the Economy Nine!

This, of course, also applies to old batteries. When taking a hydrometer reading never hold a lighted match over the battery, as the gas that forms during the charging period is highly explosive. If it is necessary to use a light, provide an electric lamp on an extension cord.

Hints on Variable Resistors

Do not expect a resistor to handle more current than its rating calls for. These instruments are available in a wide range of values to meet all requirements, so, when selecting a resistor for any special job, be sure to provide a sufficiently low as well as high range to meet your needs. All extraneous set noises are not static as many would like to believe, but are often caused by faulty resistors. Large by-pass condensers should be shunted across the variable resistor when it is placed in a circuit handling r.f. current. These condensers should be of 1 or 2-mfd. capacity.

New Coil Requires No Shielding

The coil shown in the photo has been designed so as to eliminate the necessity of shielding and of finding the axis of the coil for insertion in a radio-frequency set. At 8-in. separation, the coupling of coils is claimed at infinity and at 6 in. almost negligible, while a 5-in. separation is said to produce highly efficient results. The coil is so built that it may be used in a straight r.f. set or in a bridge circuit; it is also suitable for use with either 201-A or 199 tubes, the new 240 tube or the new a.c. tubes. All one needs to do after determining which tube is to be used, is to bring the B-lead to the proper screw in the base designated for that particular tube. It is also possible to use the coil in a split primary circuit.

Vest-Pocket Radio Receiver

A practical crystal receiver of the vest-pocket type, weighing but 4 oz., is now available. This set is tuned by means of a sliding contact fastened to the hard-rubber knob shown at upper right in the insert. Aerial and ground connections are made at top and bottom, and the phones on the two outer clips at bottom. For the traveler, or where a temporary installation is required, it is an easy matter to throw a length of flexible wire out of the window for an aerial and run a short connection to the radiator for a ground. The set is selective and brings in the local broadcast programs with very satisfactory volume and clarity; the fixed crystal detector requires no adjusting.

Vest-Pocket Set in Use, Showing Simple Connections; Insert Is About One-Fourth Actual Size

High Aerial Not Good for Tube Sets

Radio sets of the vacuum-tube type do not require an extremely high aerial; in fact, there are several reasons why a high aerial should not be used. A low aerial will not pick up as much static as a high one and better selectivity is obtained with short, low single-wire aerials.

Wall Aerial Resembles Tapestry

To eliminate some of the objectionable features of the usual indoor aerial, which is strung across the room, an artistic imitation of tapestry, containing an aerial, has been placed on the market. The aerial is more than a number of wires connected together; it is a tuned aerial of low natural period, but of large capacity, which is claimed to make tuning sharp. The wires are held in position by an insulating compound, which is not only a good dielectric, but is impervious to moisture, thus preventing loss of energy during damp weather.

Specializing the Radio Tube

All devices, to be really efficient, must be designed to do the work they are intended for especially well. This concentration of detail has now been applied to the radio tube; it was a very fine and simple idea to have a standardized tube that may be used in any position in the set, but this convenience was purchased at the sacrifice of good results. The radio set of the past was limited as to sensitivity, volume and tone quality. The reason for this lies in the fact that the old single standard tube might give good satisfactory results on weak signals, but on powerful signals, it became overloaded, which resulted in distortion. The art has now reached a stage where it becomes necessary to have a receiver that will faithfully reproduce the really good programs that are available. Broadcasting has interested the music lover who will not tolerate distortion, and now, with the special-purpose tubes and better circuit design, the quality of tone obtained puts the radio receiver in the musical-instrument class.

We now have a tube specially designed as a detector possessing greater sensitivity without increasing battery drain or complication of adjustment. This tube is known as the UX-200A or CX-300A type. There are also tubes designed for resistance-coupled stages of amplification and power tubes with ample reserve current-carrying capacity enabling them to reproduce fortissimo passages in full volume. The name power tube is incorrectly applied, however, as it really does not supply its own power to the signal, but merely handles the power, which comes from the increased B-battery voltage.

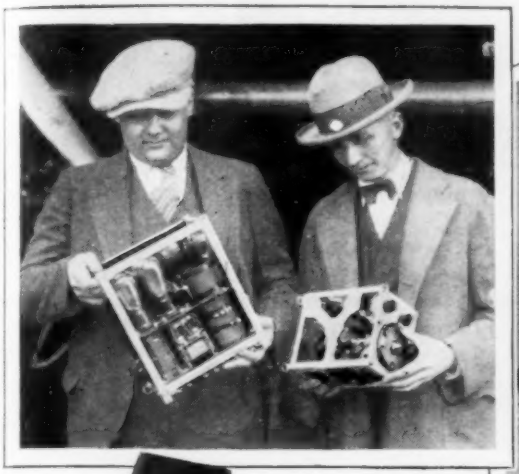
Advantage of Adjustable Plate Voltage

There is no better method of controlling volume and balancing one tube with the succeeding tube than by controlling the plate voltage of at least the r.f. tubes, and the detector tube also if possible. Variable resistors of proper values are now available for controlling plate voltage and are coming into common use. They are an important part of modern B-eliminators and their use in the set itself is a decided advantage, especially now that new tubes, with plate resistances that vary from the common type of tube, are being introduced.

Tester Aids Radio Service Man

To facilitate testing for short and open circuits, the device shown in the drawing will be found to be of equal usefulness to the radio service man, the electrician, the phone man and to the garage mechanic. The device consists of a headphone and a flashlight battery, together with the necessary cord, a testing clip and a tip. A button on the battery case closes the circuit.

Facts and Fads for Radio Fans



Upper Left, Lloyd Bertaud and Clarence Chamberlin Examining New Radio Apparatus Designed for Transatlantic Airplane Use; Right, Emil Berliner, Inventor of the Microphone, Displaying a Replica of Original "Mike," Invented in 1877

Above, an Attractive Radio Cabinet Copied from the Modern Baby-Grand Piano; Right, Dr. G. Breit and Dr. M. A. Tuve, Research Investigators of the Carnegie Institution at Washington, Conducting Experiments Verifying the Existence of a Layer in the Upper Air Which Bends Radio Waves Back to Earth; Changes in the Layer Are Said to Cause the Phenomenon Known as Fading

Novel Radio Fan

An old suit of clothes, a quantity of straw, a cone-type speaker and a bit of paint were used to make the novel radio fan shown in the photo. Connected to a receiving set inside of a radio shop, the talking man is placed in front, attracting attention as speeches and music are reproduced. A further novelty originated by the enterprising dealer is that the dummy may be disconnected from the receiver and the dealer can talk into a microphone through the dummy to persons in the street.—Fred O. Thompson, Long Beach, Calif.

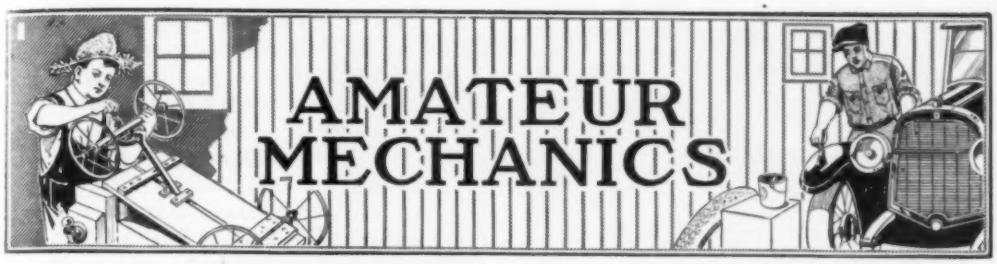
Where to Look for Trouble

When the set goes dead or the signals are not what they should be, make a systematic examination of the entire installation. This may be a process of elimination, and a few suggestions as to where to start and what to expect, will often result in a quick recovery without the expense of calling in a service man. First make sure that all the tubes are lighted at the proper voltage; examine the aerial and ground and see that the connections are all tight and that there is no chance of aerial leakage. Check the B-batteries with a voltmeter and see that the proper B-voltage is supplied to each terminal in the set at its indicated value. Be sure that the C-batteries are fresh. These batteries are often permitted to stay in the set over long periods but should be renewed at least twice a year for best results. See that all tubes are of the type specified and that they are in their proper sockets. In this day of special tubes for special purposes, the set owner must not change the tubes around indiscriminately or the result may be a power tube in a detector-tube socket or some similar error.

A defective gridleak may often cause trouble, and it is well to have an extra one of the same value or several values that may be substituted. Test for defective fixed condensers and coils with a pair of headphones in series with one or two dry cells in the usual manner. If, after these tests have been made, the trouble is not yet located, examine the loud speaker. These usually have some form of adjustment on the diaphragm and, although they are adjusted at the factory, sometimes require readjustment to obtain best results with the particular set used, or because of jars in shipping. Tighten all loose connections either at the batteries or set terminals, and make sure that the A-battery is fully charged. Test trickle chargers, or any other type used, to determine whether or not they are supplying the output at which they are rated. A run-down A-battery is a very common cause of poor reception, and many set owners who are using trickle chargers with sets of the large multi-tube type never have the battery up to the point where good reception is possible. If your set employs more than five tubes of the 201-A type, use a charger having a 2-amp. output. Some trickle chargers now on the market are built to furnish a higher charging rate than the ½-amp. rate of the earlier types and may, of course, be used with larger sets.

Resistance-Coupled Power Amplifier

Designed to be added to any two-stage receiver, this resistance-coupled stage of power amplification will provide excellent tone quality and considerable volume without overloading the tubes. The device is entirely self-contained, with leads to be attached to the batteries and loud speaker, and a variable control for volume. The use of a UX-171 or a CX-371 tube is recommended in this extra stage.

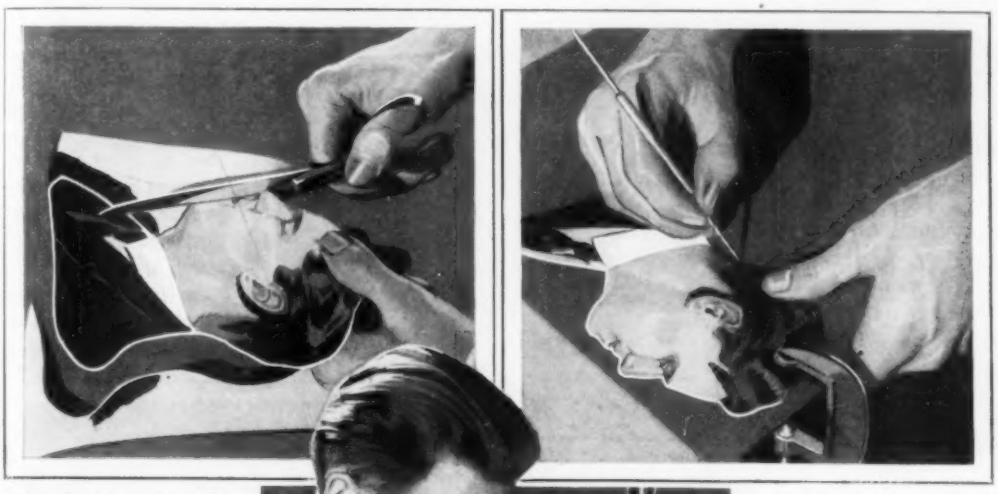


Make Your Own Portraits in Brass

By E. R. HAAN

BRASS silhouettes of friends or members of the family make attractive wall decorations, and anyone who is handy with tools, and will take the trouble to be careful, can make them. All that is necessary to start with is a photo showing the profile of the head, for obviously only profile views can be used for this purpose.

The first operation is to cut out the photo with a pair of scissors exactly along the edge of the face and head, or the silhouette will be ruined, as the likeness, of course, depends entirely on how carefully the outline is followed. Now clamp the cut-out photo on the surface of the brass sheet from which the silhouette is to be made. Sheet brass, about 1/16 in. thick, is most satisfactory for the purpose. Using a scriber, trace around the photo on the brass and proceed to cut it out with a coping saw, using a fine metal-cutting blade.



Left, Cutting Out the Photo; Right, Tracing It on a Sheet of Brass; Bottom, Metal-Cutting Coping Saw Used to Cut Out Silhouette from Brass Sheet; the Saw Should Be One with a Fine Blade

While cutting, the sheet of brass can be clamped down to the workbench as indicated in one of the photos, but, as the projecting piece of brass has some spring, which

makes cutting more or less difficult, it is better to use a 1-in. board under it, to serve as a support, clamping the board to the bench top. A "V" is cut in this board to allow for sawing, the brass sheet being moved around so that the cutting will be confined in this vee. While cutting the profile be sure to stay just outside of the line, so that the edge can be filed down to the line, which is the next operation. Any fine, triangular file, about 6 in. long, will be handy for this purpose, although occasionally a round file may be useful, depending on the lines of the silhouette. Be very careful in filing, and keep exactly to the line.

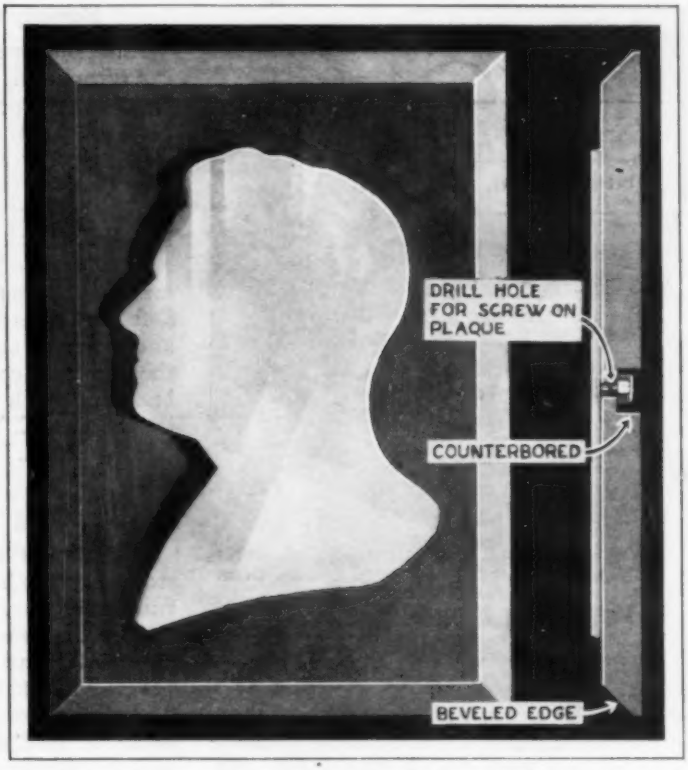
After the filing has been finished, a 6-32 flat-head brass screw, about 1 in. long, is soldered onto the reverse side of the plaque, in the center. The screw can be held securely with a pair of pliers while it is being soldered and until after the solder has set.

Polishing the plaque will then improve its appearance. This is done with a piece of No. 000 emery cloth. Always rub in one direction, or else many fine criss-cross scratches will show when the plaque is finished. When this has been done, polish the surface with a good grade of brass polish, again rubbing in the same direction.

When the plaque is thoroughly dry after polishing, a coat of transparent metal lacquer is applied. As this liquid dries quickly, one cannot go over the same spot twice, but the whole surface must be covered quickly without any laps. Use a soft brush that will not shed any hair, as this would necessitate removing all the lacquer and doing the job over again. If it becomes necessary to remove the lacquer on account of some mistake, use turpentine, and wash it off immediately. It should be remembered that the surface of the plaque must not be touched after it is polished, as fingerprints and other marks will show up clearly, and they cannot be removed after the lacquer is applied. To prevent dust from getting in the lacquer finish, be sure to wipe off the surface of the plaque before lacquering.

Edges Are Dressed Down with a Small File; Soldering a Brass Screw to the Back; Surface of the Plaque Polished; Dusting Off the Plaque before Lacquering

The plaque, when completed, should be mounted on a beveled base, made of ¾ or 1-in. wood, having a very close grain. A hole is drilled and counterbored to receive the screw on the plaque, and a nut and washer run on the end of the screw. A pair of long-nose pliers or a socket wrench, such as is used for hexagon nuts in radio work, can be used to tighten the nut on the screw. The base is, of course, finished before the plaque is attached. Flat black paint or very dark stains, wax-finished, give a good contrast to the work; the plaque is glossy and should have a dull-finished background.

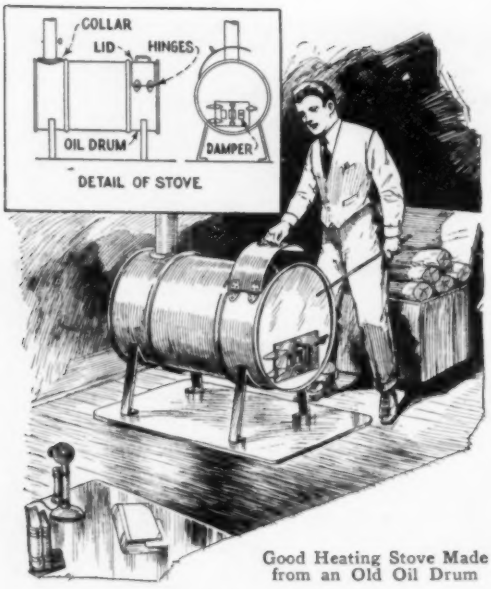


Completed Brass Plaque Fastened to a Beveled Base, Made of One-Inch Wood and Finished in Dull Black

How to Mend Broken Concrete Articles

Contrary to common belief, broken concrete articles can be mended to make the section where the break occurred even stronger than it was originally. In this way garden furniture, sundials, bird baths, and, in fact, almost any damaged cement object can be restored to usefulness. The first step is to soak the pieces in water for at least 12 hours. After this, drill some holes in the broken edges of each piece so that the holes line up opposite each other when the pieces are held together. If the break is a compound one it is best to assemble it piece by piece. The two largest pieces are cemented together the first time and, after the cement has set, the smaller pieces are added. The holes may be made by sharpening the end of an ordinary screwdriver and turning it constantly as it is being tapped with a hammer, although a regular star drill is better. Too violent blows might cause a new break and therefore care must be taken in drilling. After the holes are made, soak the pieces in water again for a few minutes and then fill the holes with soft, freshly mixed pure cement. The largest piece is set securely so that the fracture is straight up, and supported firmly. A few pieces of No. 12 or 14 iron wire are now cut to a length slightly less than the combined depth of the opposing holes, and inserted into the soft cement of the base piece. The edges of both pieces are again made thoroughly wet and smeared over with a thin coat of neat cement. The pieces are squeezed into place so that the break fits snugly, the surplus cement is carefully removed, and the pieces are covered with wet rags and allowed to set for 24 hours. The pieces should not be disturbed during this time, as the slightest vibration will destroy the crystallization of the concrete in the break. After the first pieces have been cemented together, the process may be repeated in the same way until the whole object is mended. —Oskar J. W. Hansen, Chicago, Ill.

¶A lighted match held to the outside of a fish-pole joint causes an expansion of the outer ferrule and allows the pole to be readily pulled apart.



Good Heating Stove Made from an Old Oil Drum

Oil Drum Makes Good Stove

In a general store of a small town, the proprietor uses an empty oil drum as a stove. The drum was first cleaned thoroughly inside and then mounted horizontally on two supports of heavy flat iron. The legs were long enough to support the drum about a foot above the floor and were bent so that they could be bolted to it. A 5-in. round hole was cut in the top, at the rear end, around which a collar was riveted to attach a smoke pipe. Then a section of the top, between the two front ribs, was sawed out about a third way around the circumference. A similar section, but slightly larger, was removed from a second drum, a handle provided in the center and hinges at one end, the latter being riveted to the drum. This made a large lid that fitted snugly over the opening. A small rectangular piece was cut out of the front head near the bottom. A slightly larger door with slide openings was made to hinge over the opening and it was fastened with a metal door latch. The entire cost, including that of the drum and a little work by a tinsmith, was less than five dollars.—L. B. Robbins, Harwich, Mass.

¶In machine work a way must be provided for removing dowel pins before they are driven in place.

Remedy for Jerky Slide Rules

New slide rules, and old ones that are not often used, are frequently so jerky that it is an exasperation to use them. The surfaces of the tongue-and-groove slide grip together and make a careful adjustment almost impossible. Soap, oil and grease are dirty and ineffective lubricants, but lead-pencil graphite seems to fill the rough pores of the wood and give a permanent sliding surface. Simply rub a soft black lead pencil along the tongue and contact surfaces of the slider until they are well coated. Then work the slider back and forth in the slide until the action is smooth.—C. W. Brockunier, Pittsburgh, Pennsylvania.

Removing Stuck Glass Stoppers

The simple method of removing glass stoppers from bottles, as shown in the illustration, has never failed me no matter how tightly they may stick. I grip the bottle in my left hand with my thumb very firmly pressed against one side of the stopper. Then with the right hand I take a wooden stick of medium weight and strike the cork or stopper on the opposite side, directing the blow toward the thumb with a slight tendency upward. At the same time I resist the blow with the thumb. Two or three taps will loosen the tightest stopper and the thumb pressure will prevent either bottle or stopper from being broken.—Gregor H. Glitzke, Kansas City, Mo.

Test for Lubricating Oils

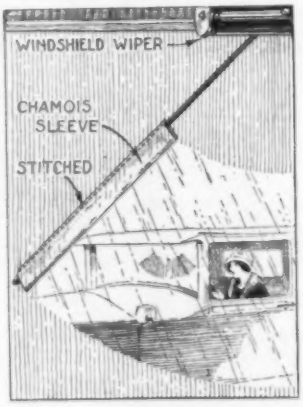
Place one drop of each oil to be tested on a piece of glass so that the drops will be in a line across one end. The glass should be about 3 in. long and wide enough to hold a number of drops in this way without their mixing. Raise the end on which the drops were placed about 6 or 8 in., to

form an inclined plane, so that the oil will run down slowly. An oil having a light body runs and dries quickly, but an oil that has both a body and a free flow will be readily detected by this test. An oil may have a good body and yet have a tendency to gum badly, which will also be detected on the glass. The oils should be protected from dust while the tests are being made.

Improving Flake Glue

A satisfactory glue, which has greater adhesive qualities than the ordinary article, has no disagreeable odor and is suitable for furniture repairing as well as other purposes, can be prepared by puting a quantity of best-grade flake glue in a bottle nearly filled with carbolic acid, diluted with water, and then heating the whole until the glue is thoroughly dissolved. It is best to allow the glue to soak overnight before heating it. The consistency of the glue is controlled by the addition of either the diluted acid or glue. The best results are obtained with a glue having a fairly heavy consistency.—W. J. Edmonds, Jr., Whitehall, N. Y.

Windshield-Wiper Kink



It frequently happens after a dry spell that the windshield wiper is found practically useless, because it does not wipe clean. This is usually because the rubber has dried out. A good remedy is a long chamois sleeve or bag which fits tightly over the wiper. When the chamois becomes wet it adheres snugly to the glass and wipes it clean.

"Roll-Down" Incorporated with a Seesaw Provides Additional Amusement for the Children

Combination "Roll-Down" and Seesaw

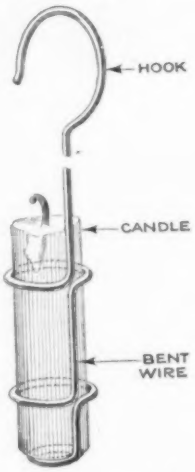
To add to the enjoyable exercise of a seesaw, it can be combined with a roll-down game, which will interest children for hours. The seesaw board is removed and a boxlike attachment is built onto it, as shown in the illustration. At each end of the shallow box, sheet-metal strips, bent as indicated in the detail, are nailed, to provide 3-in. pockets. In the middle section of the board rows of nails are driven, spaced about 3 in. apart to produce a diamond-shaped figure. Each pocket is then numbered. With this done, the board is mounted on its support. A small hard-rubber ball is placed on the board and the game begun, the object being to score by rolling the ball into the pockets.

¶After cleaning a shotgun or a rifle, a cork, large enough to be seen readily, should be placed in the end of the barrel to prevent rusting. The cork should not be pressed into the end deeply as, if it is forgotten, a dangerous explosion results.

Bill File from Tobacco Can

A system for filing is needed by the housewife as well as by the storekeeper, and instead of letting bills accumulate on the shelves of the pantry, it will be found much more convenient to keep them in a flat tin can, such as a tobacco can. The top is cut off, a hole drilled in one side and the opposite side cut out as shown. The can is then tacked up in the pantry at any convenient place.

Camp Candlestick Made of Wire



A piece of wire, about 18 in. long, makes an excellent candle holder for the camp. Two rings are twisted in the wire, about 2 in. apart, and large enough for the candle to fit into. The lower end of the wire is turned under to make a base on which the bottom of the candle rests, and the other end is bent into a hook so that the candle can be hung from the branch of a tree or the ridgepole of the tent.—Lloyd L. Stewart, Crawfordsville, Ind.

Homemade Paint-Remover Paste

To do a first-class job of painting autos or farm implements, the first thing is to get down through the old paint and grease to a clean surface. Here is a paste that can be made at home at little or no expense and will remove the paint effectively: Dissolve eight heaping tablespoonfuls of cornstarch in a gallon of water in one container, and, in another, one and one-half cans of lye. Then, stirring well all the time, pour the lye solution into the cornstarch. This will make a thick paste without lumps. The containers should be of porcelain or glass, as the paste will attack tin, copper or aluminum. Remember this paste is a paint remover, so take no chances of its getting on where it is not intended. It is best to remove the fenders from the car before starting, or the enameled parts can be protected by smearing them with grease. With a brush or swab, put the paste on the surface from which the paint is to be removed, in an even, thick coat. Let it stand until it starts to dry and then scrape it off with a putty knife or steel brush. Cover only small areas at one time. If the paint is unusually stubborn, a second coating may be necessary. The paste can also be used in dressing up the tractor and other farm implements. On these, it will speed up the operation to remove all small parts from the machinery and let them soak in a lye solution of one can of lye to a gallon of water. The same solution is also good for removing grease and dirt from the engine. Flush well with water before attempting to repaint and let dry for a few days also. If there is any of the lye water left in the cracks or corners, it will run out after painting and ruin the job.—Ralph W. McPherson, Omaha, Nebr.

Tension Regulator for Tents

The spring attachment shown in the illustration prevents the umbrella type of tent from becoming too tight in damp weather and takes up the slack as it dries out, eliminating the necessity of adjusting it by hand.

The attachment consists of a length of coil spring of sufficient tension to hold the supporting arms in place. It is slipped into position over the center pole and held by a removable pin. It takes no additional space and the weight is negligible.

Repairing Ford Rear Axle

The thread on the right rear axle of my Ford car was stripped. This meant that the nut which held the wheel on could not be tightened, and the wheel was in constant danger of coming off. At first the only way to fix it seemed to be to replace the axle, which would take several hours of labor. I got around this by buying a new nut, sawing through one side with a hacksaw and then pressing the nut together again. This decreased the diameter of the nut by a very slight amount. After welding the joint, making the nut as strong as it was originally, I screwed it onto the axle. It caught the worn thread and held fast as it cut into the threaded axle a little deeper than the original nut. This repair has been perfectly satisfactory.—Edward A. Hine, Hoboken, N. J.

Pocketbooks Make Ammunition Belt

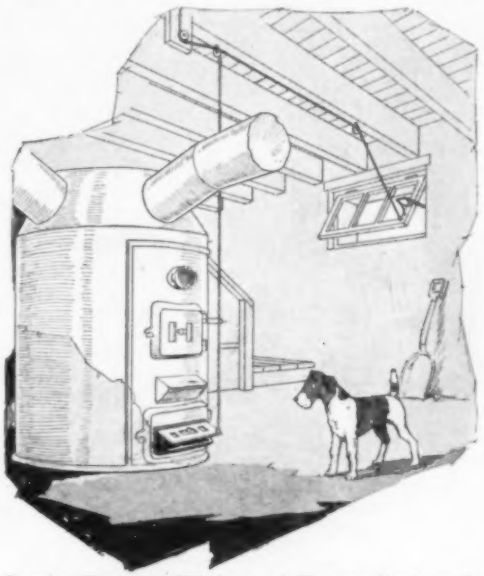
The accompanying photo shows how an inexpensive ammunition belt may be made. Two small pocketbooks were purchased at a 10-cent store and riveted or sewed to a cheap leather belt. Each pocketbook has two compartments. This makes it possible to carry both large and small cartridges at the same time. One of the pocketbooks is used to carry a license card, and the button is placed on the flap. The capacity of a belt like this may be increased by simply adding more pocketbooks. The belt is especially handy because the license and button are always easily accessible.

Two Ten-Cent Pocketbooks and a Cheap Belt Make a Good Ammunition Holder

¶A simple method of bracing a screen door is to stretch a stout wire diagonally across the lower portion of it.

Automatic Draft Accelerator for Furnace

Many installations for refreshening the furnace fire in the morning have been evolved, the most popular, of course, being to attach a chain leading over a pulley up to a convenient place alongside the bed, or connected in some way to an alarm clock. But in many cases, this is not enough. If the furnace is not connected to an outside source of air, the air in the basement may be too still, and it will take a long time to revive the fire. However, this can readily be remedied by attaching an additional chain to the nearest window, as shown in the illustration. This automatically gives you plenty of air circulation, which helps the fire immediately. A coil spring will keep the window closed when the chain is released and there will be no danger of the wind blowing it open.



Opening Basement Window and Furnace Draft at the Same Time Brings the Fire Up Quickly

Damp Spots on Wallpaper

Mold or damp spots on wallpaper are not always easy to remove as all will acknowledge who have tried it. It is, however, not difficult to do this with a mixture consisting of salicylic acid, one part, and alcohol, 90 parts. Use a soft cloth or small sponge to daub the spots. In a few moments they will all disappear.—L. M. Georger, Buffalo, N. Y.

Paper Spindle Holds Flypaper

When sticky flypaper is placed on counters, desks and showcases in stores and offices, it frequently becomes a source of great annoyance, epecially when the electric fans are used, or when a breeze enters through the opened windows. To obviate this trouble, one merchant employs a number of paper spindles, which are securely mounted on wooden blocks, 8 in. square. To attach a sheet of flypaper to the holder, it is rolled into a cylinder, with the ends overlapping about 1 in., and the doubled section is then pushed over the spindle point, as shown in the illustration. When mounted in this manner, the paper cylinders present a full surface for flies and yet remain in their place.

Holder for Sticky Flypaper Prevents It from Being Shifted by Breeze

Chemical Windshield Wiper

As every driver knows, even the automatic windshield wipers will leave a blur on the wet glass. To prevent this, sew a piece of felt in the form of a long, narrow bag to fit over the rubber wiper. This should fit tightly so that it will not slip off. A small quantity of denatured alcohol and glycerin is mixed in equal parts, in a bottle, and the felt bag is saturated with this solution. It will remain effective for a long while, so that the solution need not be added frequently. Nor is it necessary to have the wiper operating constantly. On a wet day, start and let it run for a few seconds, and the rain will then glide off immediately. Repeat about every half hour.—Herman R. Wallin, Brooklyn, N. Y.

Substitute for Bottle Labels

Paper labels pasted on jars and bottles in the laboratory or photo dark room, are often soiled by age or damaged by the chemicals themselves until they are practically illegible. This occasioned one amateur to perform a most disastrous experiment, and therefore he conceived the idea of making permanent labels. This he did in the following way: The surface of each bottle was roughened with emery cloth so that the contents could be indicated by writing. When a bottle was empty and used for some other purpose, the writing was erased for relabeling.—G. E. Hendrickson, Argyle, Wis.

Teaching Dog to Open Door

By using a bone as an inducement a dog can readily be taught to open a swinging door, such as a screen door, without assistance. A large bone is fastened with a wire to a screweye, which is driven into the door at the right height. Any dog is curious, and it won't be long before he finds out that he can pull the door open himself by taking hold of the bone and pulling, as he will nat rally do.

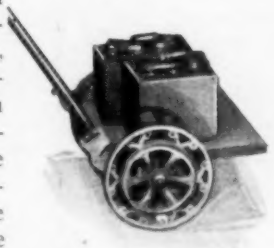
Attaching a Bone on a String to a Swinging Door Teaches Dog to Open It without Assistance

Varnish Remover

Often we have several old pieces of furniture which, if refinished, would answer our purposes very well. Varnish removers are rather expensive, so when it is absolutely necessary to remove the varnish and get the wood down to its raw state, other means are employed. For instance, when a golden-oak finish is to be changed to an early English, or vice versa, or a fumed-oak piece changed to an early English, take caustic potash, 1 lb., starch, ½ lb., and water, 3½ lb., which is equal to 3½ pints. Add enough of the water to the starch to make a paste and dissolve the potash in the remainder of the water. When both mixtures are cool, stir them together thoroughly. If the mixture is too thick for spreading, thin it with water to the consistency of glue. Cover the entire woodwork of the furniture with the mixture and, when the varnish is softened sufficiently, scrape it off with a putty knife or scraper. After the finish has been removed, it is necessary to thoroughly sponge off the wood with pure water and, in case the remover has been left on too long and is found to have turned the wood to a slight tint of brown, you will find that this will not interfere with any of the colors in fashion these days. The removal by water may raise the grain, but this will only have a tendency to help dispose of the filler and again to open the pores so that they are in better condition to receive the new finish.—H. R. Calhan, San Francisco, Calif.

Handy Storage-Battery Truck

A handy truck for carrying storage batteries, or other heavy loads, can be made from a discarded lawn mower by removing the knife, bolting on a handle and putting on a suitable platform. The handle is, of course, arranged so that the platform will be perfectly horizontal when the handle is at the most convenient position. Such a truck is handy around a battery shop.

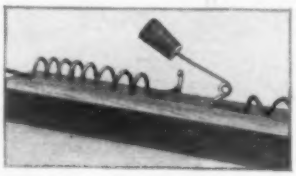


New Use for Old Can Rubbers

Many housewives have noticed that scratches on the bottom of their kitchen sinks are caused by the dishpan and other utensils. To avoid these marks and scratches, one housewife connects her old can rubbers with twine to form a mat for the sink bottom, as shown in the illustration. This can readily be washed and dried so that it is quite sanitary and can either be left in the sink or hung up near by.

Safety-Pin Switch

When experimenting with some homemade solenoids and trying to get them to work a signal apparatus, several light switches were needed. The photo shows how a safety pin was used for this purpose. The catch side of the pin was cut in the middle and the pieces were sharpened to a point where cut. They were then forced into a block of wood. A cork was pushed on the point end for a handle. The spring in the point side kept the contact free when removed from the hook.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

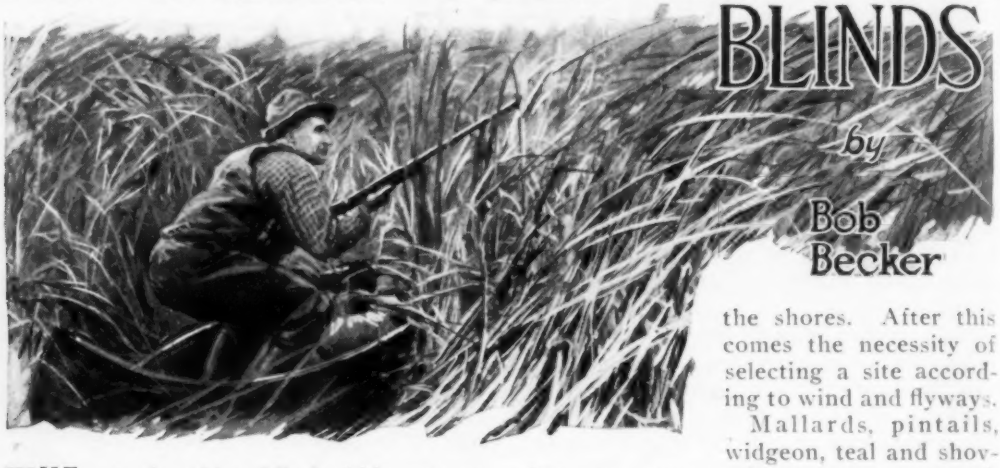


Wood Rot in Flower Boxes

Wooden flower boxes can be made practically free from wood rot by using the following method: Before filling them with earth, coat the inside surface with whitewash. This will prevent insect life to a great extent and will keep the wood in good condition for many years.

How to Build GOOD SHOOTING BLINDS

by Bob Becker



THE art of making blinds, hide-outs or other places of concealment is as old as the sport of hunting. Indian bear hunters of Alaska have, for many decades, constructed blinds along salmon streams from which they could shoot the big brown bears of the north country. South American Indians know the trick of making a hide-out in the low branches of trees from which they can kill the big jaguars, the largest cats in America. In wild-fowl hunting this same art of concealment is practiced, and the successful duck and goose shooter must know something of the craft if he wishes to come home from his hunt with good bag. The warier the birds the more woodcraft skill is needed, and akin to this requirement is that of decoy location, use of an artificial caller and various other tricks of the trade.

FIG. 1

In hunting marsh or puddler ducks, birds that like to frequent, and feed in, shallow ponds, lakes or bayous, one of the first rules in blind making is to take advantage of any natural vegetation along the shores. After this comes the necessity of selecting a site according to wind and flyways.

Mallards, pintails, widgeon, teal and shovelers are among the commoner marsh ducks which are usually shot from shore blinds with a stand of wooden or live decoys in front of the place of concealment. These birds come into a stretch of water and to decoys, circle and then swing in to light against the wind. In making your blind for a day's or season's shooting on a body of water try to locate it so that you will have the advantage of prevailing winds and get your shooting at birds facing you as they come in against the breeze (see Fig. 1). For example, in many sections of the United States the best shooting on waterfowl is had during storms with north and northwest winds blowing, or when a snow flurry and high winds are coming from the east and northeast. If possible, the duck hunter should locate two blinds on the shooting hole so that he can change about when the winds veer. One of the hide-outs on the bank and at the water's edge should face west or southwest. This blind is for shooting when the wind is in the east or north-

east, as then the birds will swing in to decoys against the wind and facing the hunter. The other blind should be located so that it looks east or southeast.

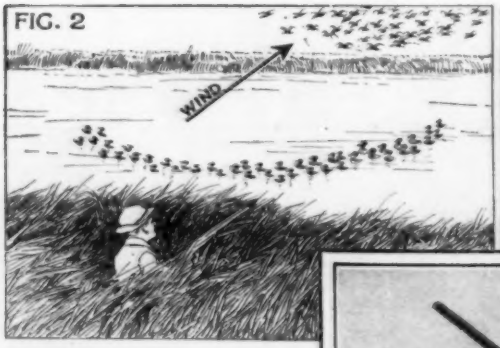
The site or sites selected, the next step is construction of as "natural-looking" blinds as possible. Ducks, especially mallards and pintails, are quick to size up the appearance of a pond and its surroundings, and if any features look suspicious, away they go. The more they circle, the keener their observations. A piece of white paper carelessly left on the ground near the blind, weeds, cattails, rushes or other vegetation along the shore cut or disturbed too much, or a slight move on the part of the occupant of the blind, often scare the wary birds so that the hunter is not able to get in a single shot.

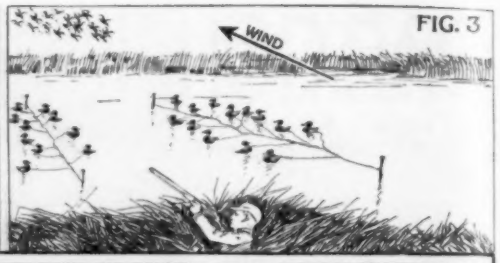
Taking Advantage of Small Shrubs and Shore-Line Vegetation; This Is the Famous "Downton Bob" and His Master, Dean Swift; Note the Hole to the Left of the Dog, Made by Him So He Can Mark Fallen Birds

If there are no weed patches, cattails, tules or other growth along your duck pond, tall enough for concealment purposes, you should get busy before the hunting season and supplement the natural growth with willow branches stuck in the shore, or tall weeds of the same kind as grows along the shore line. This "landscaping" should be done early before the flight begins, so that the birds can get used to it. Be sure to place such a growth also at the point where you intend to make your shooting blind.

Above, Blind Made of Rushes and Grass Stuck in Chicken Wire; Left, Staking Out a Live-Goose Decoy on a Sandbar

If the shore line has a good stand of vegetation, the problem of making a blind is much simpler.

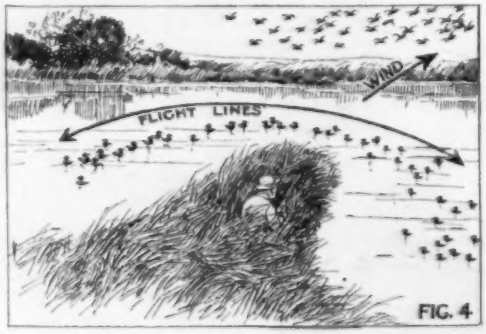




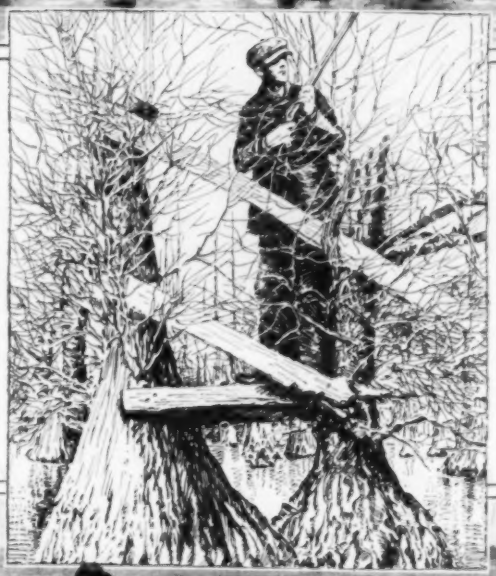
Right, a "Natural" Marsh Blind Made of Standing Rushes at the Edge of the Pond

For a hastily made temporary blind suitable for just a day's shooting, all the tools you will need are a knife and a few pieces of string or old wire. Step into the stand of cattails, weeds, rushes or other growth along the shore and cut out a circle 36 to 48 in. in diameter. As you slash the vegetation, take a handful and tie it together with string and then ram it down in the ground to increase the screen around you. If a few short twigs are handy (you can't always find them in a marsh, however), wedge several around the edge of the blind so that the bundles of weeds can rest against them.

A blind 3 to 4 ft. in diameter is large enough for one person. For two, or one hunter and a retrieving dog, it is a good idea to make them wider, always leaving the vegetation standing at the back of the blind with the exception of a narrow swath through which the hunter can enter. Last fall our permanent duck blinds measured slightly more than 5 ft. in width and about 39 in. in depth with the vegetation sloping inward, as a pitch toward the center furnishes more of a screen for the hunter.



The permanent blind, constructed to last through an entire season of hunting, requires more labor, but even then a good one can be made in the marsh in an hour or two. A band of ordinary chicken wire, 18 to 36 in. wide, three or four roughly made stakes, a few boards, a hammer and sharp knife are the tools and material needed. Locating the blind as close to the water as possible, either in the swamp vegetation, at the edge, or behind a small clump of willows or other shrubs, drive the stakes in the shape of a half circle, and then add two or three to form the back of the blind, the latter being arranged in a straight line. Bend the wire around these stakes and fasten it with small brads. The wire forms the backbone of the blind; into and against it the cattails, tules, tall grass, twigs, or other stuff used to make a screen, can be woven. Last fall we had one blind at



Above, Setting Out Decoys on Louisiana Lake; Center, a Rare Type of Blind, Built in a Cypress in the Middle of Reelfoot Lake, Tenn.; Below, Setting Out Silhouette Goose Decoys

the edge of a cornfield which was fringed with weeds 5 ft. tall. To make the hide-out blend into the surroundings, we used both dried cornstalks and weeds, the material being cut from a spot several hundred yards from the blind, so as to leave the surroundings of the blind as natural as possible.

FIG. 5

And now for the furnishings of the blind. If the ground is muddy (and most sites for blinds are, as they lie close to the water's edge), it is a good idea to make a rough board floor. A small box painted brown, or whatever you want for a seat, should be placed at the back of the blind. Inasmuch as duck shooting usually means fairly long hours, it is wise to spend considerable time to make the seat as comfortable as possible. There is no need to punish oneself on a cold, stormy day while waiting for birds to show up. If you can find an old kitchen chair, saw off the legs to get the height desired, paint it dark-brown and use it for a seat. The backrest means real comfort in a blind.

Now that the blind is located, you're

ready to set out the decoys. If you have a bunch of wooden decoys be sure to set them out so as to give the flying birds some open water between the wooden "foolers"; otherwise your ducks will come in, circle and then swing to the set and go down at the outer edge of the decoys.

One of the simplest methods of setting out the wooden blocks is to string half of the bunch to the right, the other half to the left, leaving a wide open "parking spot" between them with just one or two decoys in this spot, as in Fig. 1. With such a layout incoming waterfowl are pretty sure to swing and aim for the open water right in front of the blind. Under no circumstances place any of your decoys beyond gun range, as it doesn't give you any shooting to decoy birds and have them settle down out of gun range.

Another effective arrangement of block decoys is the moon-shaped layout shown in Fig. 2, which leaves an open space to which birds will come.

In handling and placing live decoys in front of a blind, one of the simplest arrangements that a hunter can make, is to string 6 to 12 live birds from an iron stake which is rammed into the mud in the bottom of the pond. While this does not permit the scattering of decoys in front of the blind, a layout which many hunters think is most necessary late in the duck season, when it is bitterly cold and getting one's hands wet is real punishment, this single-file arrangement works and saves a lot of trouble. Take a slender iron rod of sufficient length to allow you to stick it into the bottom of the pond and still have 12 to 18 in. of the rod show above the water. Ram it into the mud about 30 ft. from the blind, after fastening to it a stout cord, at least 30 ft. long. At intervals of every 3 or 4 ft. along this cord, tie on short pieces, 18 to 24 in. long. Make these secure so they won't slip. Sew these on and then tape them so that they cannot move an inch. The next step is to provide the smallest metal snap that you can get for the ends of these short pieces.

The rod is in the water, the long cord with shorter lengths attached is in position, and now you are ready to put out your decoys.

Rowing out in your boat, you pick up a live mallard decoy, and put a patented decoy holder (the kind that can be purchased in any sporting-goods store) around its neck. If the short lengths of cord are not provided with small rings at the end, it is no trick to attach these, as the snap on the short decoy line is to be hooked up with the ring on the holder. Just go down the line hooking on your live birds to the "main line" running from the iron stake. When you come to the end, make a loop in the main line, put it over another iron stake and then ram the stake into the mud. You then have a string of 6, 8, 10 or more decoys all on one

cord, as in Fig. 3, each able to swim around a little and make all the fuss they want. Yet all can be put out or picked up with practically no rowing and when you take the birds in at night you release them by just one snap, leaving the stakes and cord in the water.

In hunting the open-water ducks (the diving birds which feed in deep water), several different tricks in decoys and blinds must be practiced. For example, while live mallard decoys are used in hunting the pond ducks, like mallards, pintails, shovelers, widgeon, etc., in gunning for canvasbacks, bluebills, ring necks, redheads and similar open-water ducks, only wooden decoys are suitable. One of the most ideal sites for your blind for such shooting is on a point separating a bay from the main body of water, especially if flying birds are likely to cut close to this point (see Fig. 4). You need large stands of decoys for these birds, especially on fairly good-sized lakes, as the mass of blocks must be large enough to catch the eye of passing birds. As coots or mudhens are often found by the thousands on such bodies of water and invariably feed with the bluebills and canvasbacks, it is a pretty good idea to get some mudhen decoys and mix them with the canvasback, red-head, and bluebill blocks.

Sandbars and cornfields, these are the two locations usually chosen for a goose hunt. Along big rivers like the Mississippi, thousands of wild geese congregate every fall, using the bars and the adjacent cornfields as their rendezvous. To hunt successfully on a sandbar, which observation has shown is the loafing place for geese, one should make a pit. Last fall we found a small growth of willows on a sandbar which could be turned into a blind, but it was only one of this type to dozens of sand pits along the river bars.

Dig a hole in the sandbar, about 4 ft. deep, 6 ft. long and 4 ft. wide. This pit will be large enough for two gunners. Board up the sides to keep the sand from caving in. Across the top, lay at least two 12-in. planks and one narrower in width. The ideal way to use this pit is as follows: When geese appear, the hunters should sit back deep in the pit, keep out of sight and not move. The operations of the birds can be watched by keeping one's face near the edge of the planks so as to be looking upward.

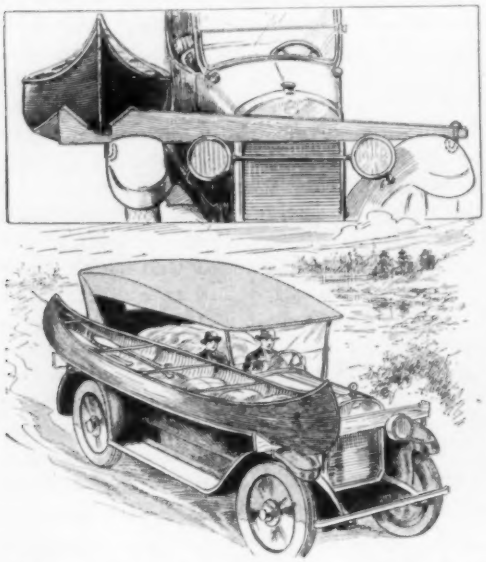
Putting out decoys is less intricate in goose shooting than in duck hunting. The majority should be set out down wind with no definite arrangement except that live goose decoys must not be staked out too close to each other. Separate them and they "call" better (see Fig. 5). In typical Mississippi river goose sets, silhouette metal decoys are set all around the pit blind, some even being stuck in the sand at the very edge of the pit. These "birds" are always faced into the wind. When a goose is shot, add it to the set by this trick: Find a small willow stick and ram it into the sand. Then take the dead goose, open its mouth and push the head of the bird upon the twig as if it were trying to swallow the twig. This will give a natural curve to the goose's neck and the posture of the bird resting upon the sand produces a very lifelike effect, much as if the goose were sitting on the sand after feeding.

Coil Spring Saves Windmill Pump

Windmill-operated pumps are usually under a severe strain when a strong wind is blowing, which may cause the bolts to become dislodged or broken from the platform. The pump, then loosened, is lifted up and down with each stroke until the rods, pipe and cylinder are more or less damaged. To avoid this, one farmer devised a simple governor. It consists of a stout coil spring placed between the pump head and the mill connection. The coil spring, partly compressed, is held permanently onto the pump by means of the bolt through the rod, and exerts a downward pressure which prevents lifting of the pump on the upstroke. It also absorbs the shock of the downstroke and a smooth, noiseless operation results.—G. E. Hendrickson, Argyle, Wis.

Canoe Carried on Touring Car

By the provision of a cradle as shown in the drawing, a canoe can easily be transported on a car. The cradle consists of two 1-in. planks attached to the car in front and behind, and ⅜-in. boards extended from the front to the rear brace. The under edges of these boards are cut to conform to the curvature of the fenders, and felt is glued on to prevent scratching. Special hook-shaped bolts are used to attach these boards, as shown in the upper detail. The fore-and-aft planks form a flexible support for the boat, and are nailed or screwed to the end planks after the canoe has been set in place, so that the latter will have sagged as far as they will go. The canoe is then strapped securely.



Wooden Cradle for Supporting Canoe Securely on Side of Touring Car

How to Make Wooden Decoy Ducks

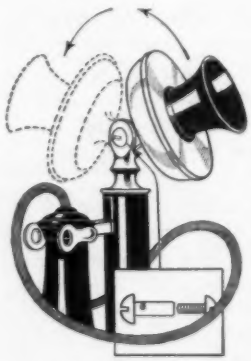
One can buy decoy ducks or one can make them. For the man who likes to build his own, there are a few points to keep in mind. No matter how artistic you may be, practicability and not art is the essential factor in decoy making. Use wood just heavy enough to float easily without bobbing around. Decoys that move too easily may scare away some socially inclined birds rather than attract them. On the other hand, don't make the decoy so heavy that it is dead and sluggish. Sensitive birds, such as the black duck or the whistler, are much more easily attracted by a decoy showing some signs of life than by a mere floating object. Load or shape the decoys so that they will not capsize easily and balance them so that the heads will not point up, which gives the impression of a take-off attitude. Flying birds will sense this and pass over instead of alighting. In painting decoys, undercolor them. Use colors ground in japan, with turpentine as a thinner. This gives an absolutely flat color and conforms to nature. Keep out details. Viewed from a hundred yards, any bird shows only bands or splotches of color and that is all that is necessary on a good decoy. Paint the underside gray so that, if the decoy capsizes, it will not frighten the flyers.

Sharpening Sewing-Machine Needles

Often the last sewing-machine needle in the house is dull and does poor work. The difficulty can usually be remedied in a few moments by placing a sheet of medium-grade sandpaper, rough side up, under the needle, and running the needle through it several times. This takes only a few moments and will improve the needle.

Right-Handed Telephone for Deaf

Persons who are left-handed and those who are slightly deaf in the left ear, and are accustomed to hold the telephone receiver to the right ear, will be better able to use the phone if it is made right-handed. The change is accomplished by removing the screw that holds the transmitter to its base. The transmitter can then be turned over so that, when the phone is in the speaking position, the receiver hook will be located on the right-hand side.—J. S. Hagans, Chicago, Ill.



How to Make and Keep a Good Lawn

By THE GARDENER

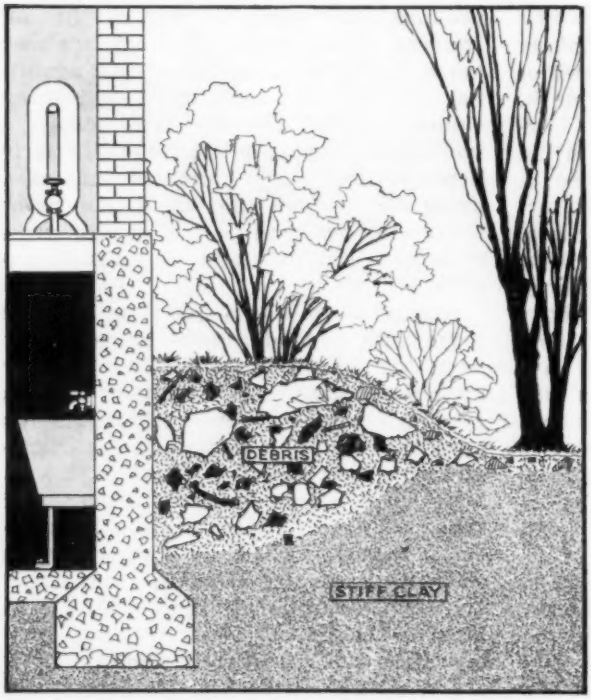
TO most amateur gardeners, fall would seem an unusual time to be thinking about making a lawn, but, as a matter of fact, this is by far the best time to do it. According to Prof. Ralph Curtis, of Cornell, "the best time to seed a lawn in the north is the last of August or the first of September . . . . When northern turf grasses, like Kentucky blue grass, redtop, red and Chewing's fescue and the bent grasses are sown in the fall, the seedlings soon produce new shoots from the short, crowded joints at the base of each stem. As the weather grows cool and the days short, these stems do not elongate as they would in the summer, when the grass goes to seed, but they continue to produce an abundance of new shoots from the base. This is called 'stooling,' and it is this stooling habit that makes these grasses good turf-forming grasses.

"When these same grasses are sown in spring, the warmer weather and longer days stimulate the stem into long growth, instead of stooling, and this, under ordinary meadow conditions, will result in a good growth of hay. If the hay is not cut, the grass will go to seed. Of course, the lawn mower prevents seed production, but, even so, the spring seedling will tend to spindle rather than to stool, and will not produce such vigorous turf as the fall seedling. The spring seedlings are also much less able to hold their own against hot weather and crab grass and other summer weeds. For all these reasons, a good seeding made in late August or early September will give northern grasses a flying start which the weeds can never overcome, provided you keep the grass growing vigorously and normally thereafter."

A good lawn, like a good house, must begin with a good foundation, and it is here that most new lawns fail, especially around new houses. The contractor, when grading around the house, seldom has the lawn very much in mind, and the consequence is that debris of all kinds, bricks, slabs of concrete, timbers, plaster and sticks of all sizes are found an inch or two below the surface, barely covered by the stiff clay excavated from the foundation and with the surface disguised by a bare inch of black soil. Grass will not grow over such stuff, so the first thing the lawn maker should do, around his new house, is to spade up the ground to a depth of at least 2 ft., so as to expose and get rid of the debris. If there is any stiff clay in the grading, spade in a few loads of sand so as to lighten it, for grass will not grow

Thorough Preparation of the Soil and Amole Seeding Are Essential in the Making of a Lawn, Especially a New One, and Too Much Care Cannot Be Spent on This

on top of clay. Good drainage is one of the most important features of a good lawn, and a stiff clay subsoil does not permit drainage, consequently the grass, if it does get started, gets "wet feet" and dies. In the absence of sand, even coal ashes, well spaded in, will lighten the soil enough to enable drainage to be established. When the ground has been thoroughly spaded and the lumps well broken up, rake the surface fine, level it off and prepare to sow the seed.



A Picture of the Usual Conditions around the New House; Grass Will Not Grow on Top of Stuff Like This

To many people grass is grass, and they do not know that there are many different varieties, each with its own preference as to location and soil. To get a good lawn all around the house, it is usually necessary to use a shade grass on the north side, under heavily leaved trees, etc. The first requisite is good seed. Go to a reliable seedsman and pay the very highest price you can afford for seed. Many of the cheaper brands, sold by other than seedsmen, contain large proportions of seeds of annual grasses, and, although these start quickly and make the lawn look fine the first few weeks, the next season it will look as if it had suffered from an attack of whatever it is that causes baldness, for the annual grasses have not come back and only a few little knots of the perennial grasses grace the lawn.

The amateur should know something of the peculiarities of the various lawn grasses, and a few of these are as follows: Kentucky blue grass is generally recognized as the best all-around lawn grass, but it does not make a good lawn the first year, and it turns brown in midsummer; it grows in all soils, but the soil must not be sour. Redtop also will grow in any soil and is good mixed with Kentucky blue grass. Creeping bent grass makes a splendid, close, velvety turf that will stand hard wear; its roots are creeping, as its name suggests. It is good in gravelly, light and moist soils, and will stand poor drainage. Chewing's fescue is another creeping grass that is good beneath trees and in other shady places; it will stand an acid soil. Fine-leaf sheep's fescue is a fine-leaved grass that is also good for shade, and in any dry soil. Rough-stalked meadow grass is the best for shade, and, as its color is very close to that of Kentucky blue, it is suitable for a lawn where the blue grass is used on the more open spaces. There are many other varieties, but the foregoing are among the most common of good lawn-seed mixtures.

Having obtained good seed, spread it on the prepared ground at the rate of 1 lb. to each 250 or 300 sq. ft. It is best to sow a strip about 10 ft. wide, rake it in one direction and then at right angles to this in order to get the seed well covered, then roll the strip down and proceed with another strip. Do not roll the ground too hard, or you may find that the grass will not come up. On the other hand, the ground should not be left so soft that every dog track on it shows up like a sore thumb. Roll it enough to get the seed into intimate contact with the soil particles. After seeding, raking and rolling, wet the seed down with the hose, using a fine spray so as to avoid washing out the seed, and wet it

down thoroughly every evening or early every morning, until the grass has got a good start. If you like white clover in your lawn, use ½ lb. of clover seed to 1 lb. of grass seed, and sow the clover seed separately, as it is much heavier.

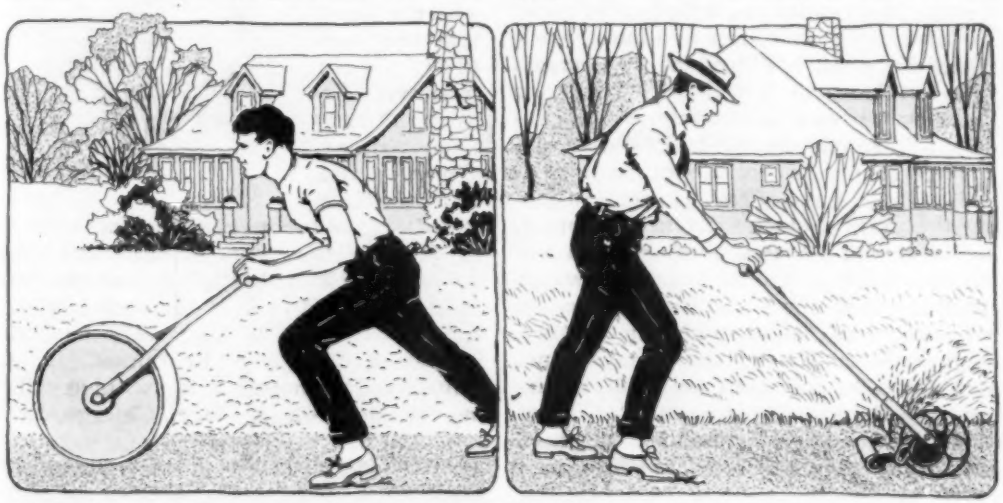
The grass should not be cut until it is about 4 in. high, and the lawn mower should be adjusted so that it does not cut too close for the first few mowings. Most people either rake the lawn clippings off, or else use a grass catcher on the mower. Don't do this; let the clippings lie. Some may object to the appearance of the clippings on the lawn, but this is not a very weighty matter, as they disappear in a day or two, and the advantages of letting them lie far outweigh this slight disadvantage. In the first place, the clippings form a light mulch over the lawn, protecting and shading the roots of the grass from the sun; in the second place, as the clippings decompose, they return to the soil some of the food elements that went into their growth, and thus they actually serve as a very light coat of manure all the year around. If the lawn is cut once or twice a week, the clippings are never heavy enough to be objectionable, and, as mentioned before, they disappear into the grass very quickly.

Rolling is a part of the care of the lawn that is seldom given the attention it deserves. It is said that a visitor, admiring the smooth, velvety lawn on an English estate, once asked the gardener what the secret of producing such a lawn was. "Well," said the gardener, "there's no secret as I know of, although it do take a bit o' patience, as you might say. You sows your grass, and then waters it, an' cuts it an' rolls it for two or three 'undred years, an' then you 'as a lawn."

We do not need to wait "two or three 'undred years" for a good lawn, but we do need to water it and cut it and roll it. Especially in the spring, after the frosts have been heaving the ground all winter, does the lawn need rolling, to compact the soil about the roots of the grass. Once or twice a month during the summer, the roller should be brought into action, preferably after a shower. In England, many of the lawn mowers are fitted with heavy rollers, so that the lawn is rolled every time it is mowed. As a matter of fact, one can hardly overdo the rolling.

Watering is another thing that is usually done wrong. Don't "sprinkle" your lawn; soak it. When the ground is merely sprinkled, the surface soil only is moistened, and the grass roots occupy this shallow layer. By thoroughly soaking the lawn, the roots are encouraged to go deeper, and are thus better able to stand the hot days of summer.

And now we come to the matter of lawn food. We cannot go on year after year growing grass in one spot and taking the food elements out of the soil without replacing them. Allowing the grass clippings to lie and decompose does return



Rolling Is a Much-Neglected Part of Lawn Care, But One That Is as Necessary as Mowing, Especially in the Spring After the Winter Frosts Have Heaved the Ground

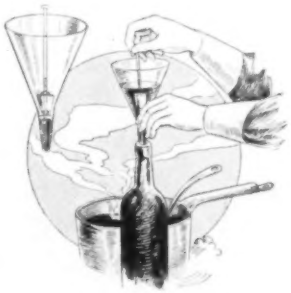
When You Water Your Lawn, Don't "Sprinkle" It Lightly; Soak It Thoroughly

some food elements to the soil, but more must be supplied. Many amateurs conscientiously spread lime over their lawns spring after spring and imagine that this is all the grass needs. This is not so; lime is not a fertilizer and very few lawns really need it. If the soil is sour, lime will help to sweeten it, and lime plays a part in unlocking the food stored up in the soil and in making this food available to plants, but the grass needs a complete fertilizer. In addition to this, lime encourages the weeds. Bonemeal is an excellent fertilizer for lawns, as it is a source of potash, which makes for good, stiff growth. It is also a safe fertilizer, for it will not "burn" the grass, even if used excessively, and the excess will simply lie until it is used up. Enough should be spread over the lawn to whiten it. Nitrate of soda is useful in giving the grass a quick start in the spring, but it should be used as a solution not stronger than 1 oz. to 2 gal. of water, sprinkled over the lawn, then washed in with the hose. Sulphate of ammonia is a good fertilizer for the bent grasses, and, as it tends to create an acid soil, it discourages the growth of weeds. It is not especially good for Kentucky blue grass, which prefers a soil not markedly acid. Most seedsmen carry a non-odorless, special lawn fertilizer which contains the proper proportions of nitrogen, ammonia and potash for the grasses, and the use of one of these is strongly recommended. Some care is necessary in using them, to prevent burning, but the amateur will have no trouble in this respect if he follows the directions accompanying the fertilizer. Hardwood ashes are also good for lawns.

Now as to weeds. There is no easy way to get rid of weeds, but their greatest enemy is a close, vigorous turf, where the seeds can find no lodgment. Sulphate of iron sprayed over the lawn, in solution, will kill dandelions without injuring the grass, but, in the hands of an amateur, this method is a trifle dangerous, so the best advice is, dig 'em out, then fill in the hole with a mixture of good soil and grass seed, press this down firmly, and the new, close grass will keep out the weed seeds. Be sure you get all the roots of the weed, as cutting it off just below the surface only causes two to appear where one grew before. If a lawn is very badly infested with weeds, it will prove simpler, in the end, to plow it up and make a new lawn.

Bottling Beverages

Everyone who has bottled beverages of any kind has experienced the waste caused by having too much in the funnel when the bottle is nearly full, with the result that the surplus liquid runs over. To prevent this, the stopper shown in the illustration will be found convenient. Get a cork to fit into the spout snugly and run a 4-in. stove bolt through it, washers and nuts being used to keep the cork in place tightly. When a bottle is full the cork is pressed down and the funnel can be transferred to another bottle without spilling the liquid.—L. J. Flugel, Chicago, Ill.



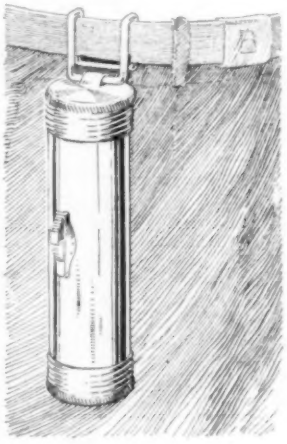
¶A simple and handy pincushion can be made of a large cork fastened to any support or base with a nail or screw.

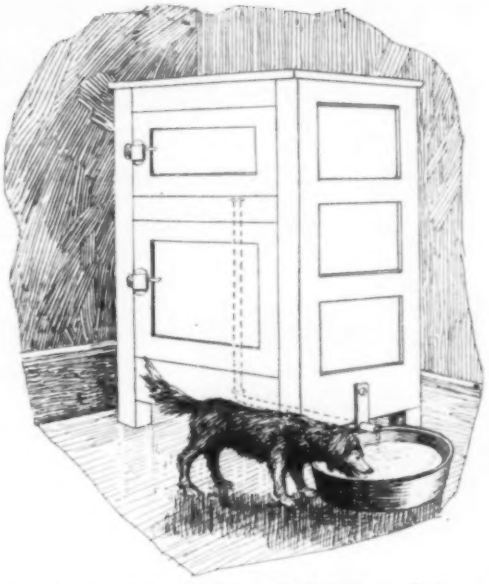
How to Remove Sugar and Starch Spots from Silk Fabrics

It sometimes happens that a silk dress of delicate color becomes soiled with a spot of sugar or starch, and as neither of these can be dissolved or removed with the usual dry-cleaning fluids, it is often considered necessary to send the garment to the cleaner. To avoid this expense and at the same time eliminate the trouble of dipping the entire garment in naphtha or gasoline, use the following method: Place the dress on the ironing board with a pad of absorbent material beneath the spot to be removed. Sponge lightly over and around the soiled spot with gasoline, marking the sugar or starch spot with a pin. Before the gasoline has evaporated, daub the stain with a clean cloth pad moistened with water. The gasoline will prevent the water from penetrating the fibers of the silk but the foreign matter of the spot will be dissolved and driven into the pad beneath. After the work has been completed, allow the fabric to dry as quickly as possible and then brush with a fine bristle brush to restore the luster when the spot is removed. A few drops of vinegar added to the water will cause it to work more quickly on sugar spots.

Flashlight Holder Hooks on Belt

Few flashlights have any means of attaching them to a belt, but a holder for that purpose can readily be made. Two slits are cut in the metal cap of the flashlight and the section between the slits is raised sufficiently to allow the metal ring or hook to be slipped under it, as shown in the illustration, the hook being bent to fit over the belt snugly, so that it will hold the flashlight securely.





Keeping the Drip Pan of a Refrigerator in Sight, to Prevent It from Overflowing

Refrigerator Drip Pan

Drip pans pushed in under a refrigerator will fill up and overflow if not attended to regularly. By placing the pan at one side of the refrigerator, the water level can always be seen and the contents make good drinking water for dogs and cats about the house. The method of altering the drip pipe for such an installation is simple: Before summer commences, set the refrigerator on end and file the inside of the end of the drip pipe clean. Then get a short length of pipe and an elbow that will just fit inside of the drip pipe and solder them together. Arrange a hanger at the side of the box to hold the added pipe at a slight pitch as shown.

Casters for the Kitchen Table

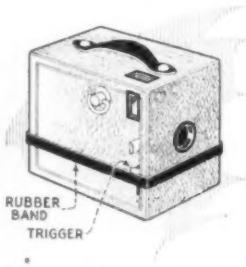
The home craftsman can do his wife a real service by equipping the kitchen table with tea-cart casters. When this is done, the table becomes one of the most helpful articles in the room, for it can be moved about easily from the stove to the sink, to the ice box, or to the entrance of the dining room. The casters have felt or rubber-covered wheels, and consequently will not mar either polished floors or the surface of linoleum.

Holding Pail Lid Tight

To hold the lid of a small pail in place so that it will not come off while carrying it, take a length of twine, about 2 ft. long, and pass it through the loop at one end of the bail, draw both ends over the top and tie them to the other end of the bail. Next take a nail and twist the twine to tighten it, as shown in the drawing. When tightened, the nail is left in place to prevent the twine from untwisting again.

Rubber Band Prevents Exposure of Film

While carrying a box or fixed-focus camera in my car, it occasionally happened that the trigger was pushed over and the film exposed, with the result that the photo was ruined. To prevent this, I now snap a rubber band around the camera, as shown in the illustration. This holds the trigger in place securely and prevents it from being pushed over accidentally. When the camera is to be used, the band can readily be removed. —G. E. Hendrickson, Argyle, Wis.

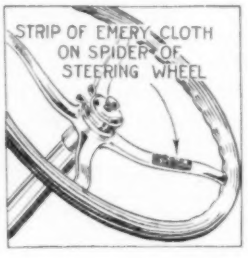


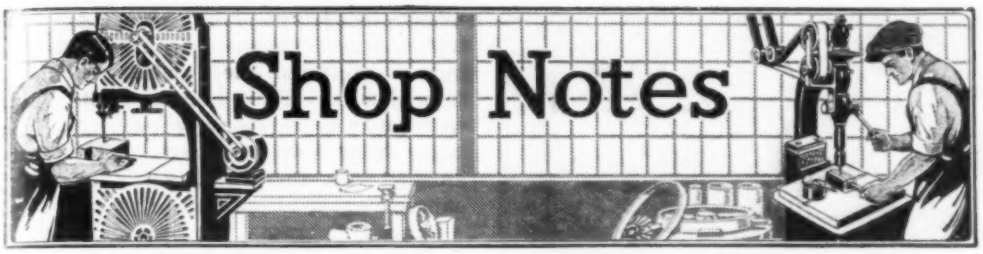
Protecting the Car Finish

Usually the sun does more to damage the high-gloss finish of an auto than rain, although the latter will check it if the varnish is still "green." An auto should never be left unprotected in the sun or exposed to a high wind, because the latter will drive sand and bits of dirt against it and will have about the same effect as a sand-blast machine. The heat of the sun will, of course, cause cracking and peeling of the varnish. If the car is kept in a garage, all cracks in the structure should be stopped up so that dust will not settle on the car, and it is best to have the floor of the building concreted. It is really better to keep the car in a cool garage than in a warm one. Sudden changes in temperature have a bad effect on the paint and the varnish. Any bare spots noticed should be touched up with paint to prevent rust from spreading, which it will do quickly, and an unpainted bolt head may furnish the start. Motor cars of today have many nickeled trimmings and these tarnish as easily as a silverplated spoon, so if the auto owner would have his car always looking nice, he must care for this nickel as a housewife cares for her silverplate. This work is irksome, to say the least, but there is no way of getting out of it unless you give the nickel a coat of vaseline, or some other protective compound. In washing the car, do not use soap containing lye, for the latter will quickly ruin the varnished finish. Alcohol will have the same effect, to some extent, and therefore care should be taken when pouring this liquid into the radiator. If you store the car for any length of time, it is advisable to provide it with a paper cover such as may be purchased from any auto-supply store. Sometimes the work of keeping the car shining may seem a thankless one, but, when the time comes for a trade-in, the owner will find that it pays.

Match Scratcher on Steering Wheel

How many times do you look for a place to scratch a match when driving? It is a simple matter to arrange a suitable scratching spot on the steering wheel, which will scarcely be noticeable and always handy. Cut a strip of emery cloth the width of one spoke of the spider and about 3 in. long. Glue this to the upper surface of the spoke and tie it down until the glue has dried thoroughly.





All Shop Notes published in 1926, in book form—Fifty Cents—from our Book Department

Putting In a New Window Glass

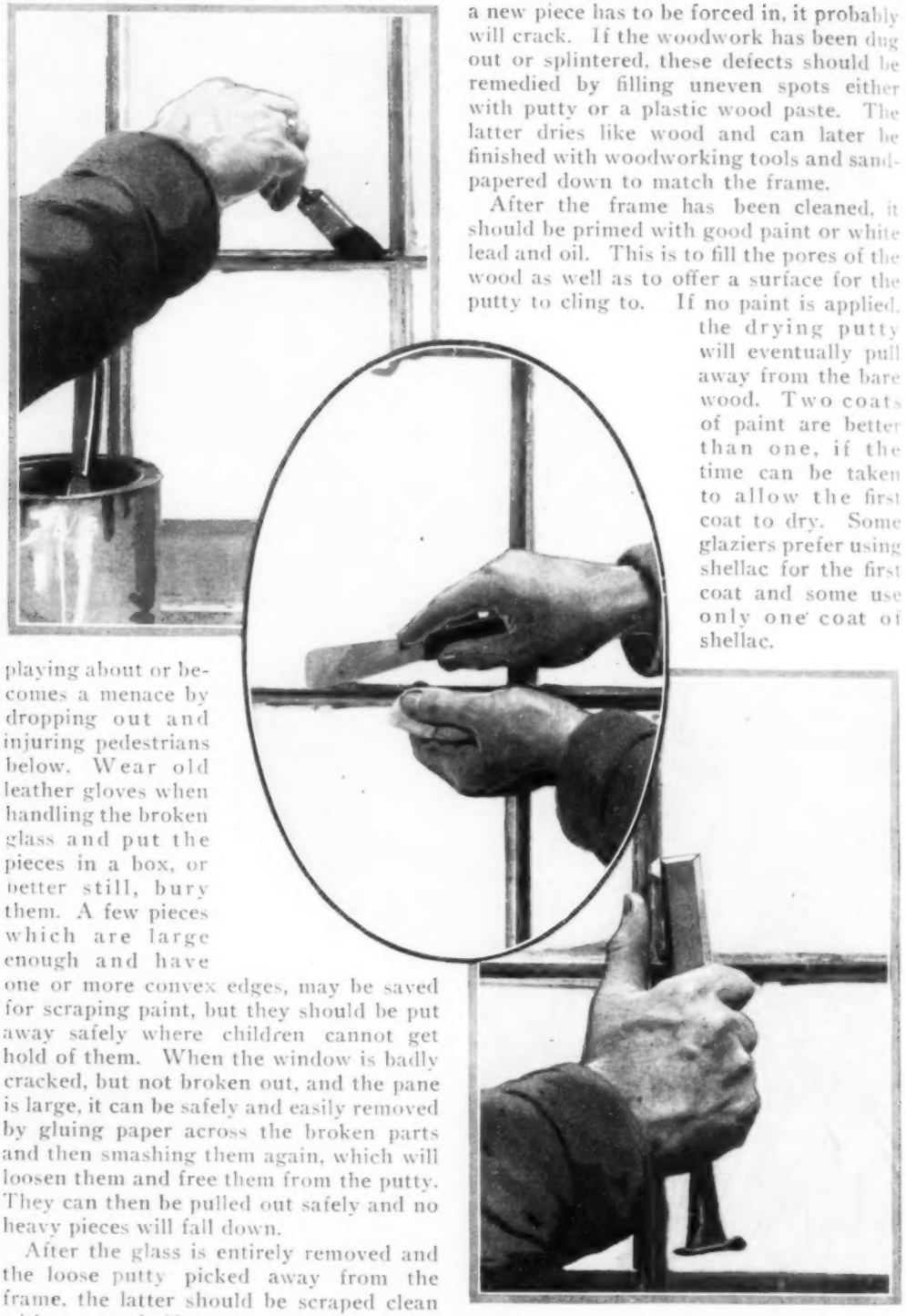
By L. B. ROBBINS

SETTING a new pane of glass in a window is one of the most common jobs about the home, yet it is surprising how many men, even "handy men," do the job wrong, from some angle at least. For success in setting a new pane of glass depends more upon the preparation of the sash before the glass is put in than on the finishing of the job. If some, or even one, of the little preparatory essentials are neglected, the glass may crack later without apparent cause; air may pour in between it and the sash or the putty may drop away and leave the bare wood of the sash exposed to the weather. These possibilities may appear to be trifles, but in a house containing a dozen windows or more they become an important matter. It may mean the saving of considerable fuel during the winter.

The time to repair a broken window is right after the accident happens. Pull out the old glass fragments and splinters and clean away all the small slivers. Then scrape the wood clean of putty and pull out the glaziers' points. Shattered glass hanging in a sash is dangerous to children

Any Home Owner Who Is Handy with Tools Can Replace Window Panes

How a Cracked Pane Can Be Shattered without Dropping Any of the Glass in Removing It



Top, Painting Frame before Setting Pane; Center, Putting On Layer of Bedding Putty; Bottom, Method of Forcing In Glazing Points

playing about or becomes a menace by dropping out and injuring pedestrians below. Wear old leather gloves when handling the broken glass and put the pieces in a box, or better still, bury them. A few pieces which are large enough and have one or more convex edges, may be saved for scraping paint, but they should be put away safely where children cannot get hold of them. When the window is badly cracked, but not broken out, and the pane is large, it can be safely and easily removed by gluing paper across the broken parts and then smashing them again, which will loosen them and free them from the putty. They can then be pulled out safely and no heavy pieces will fall down.

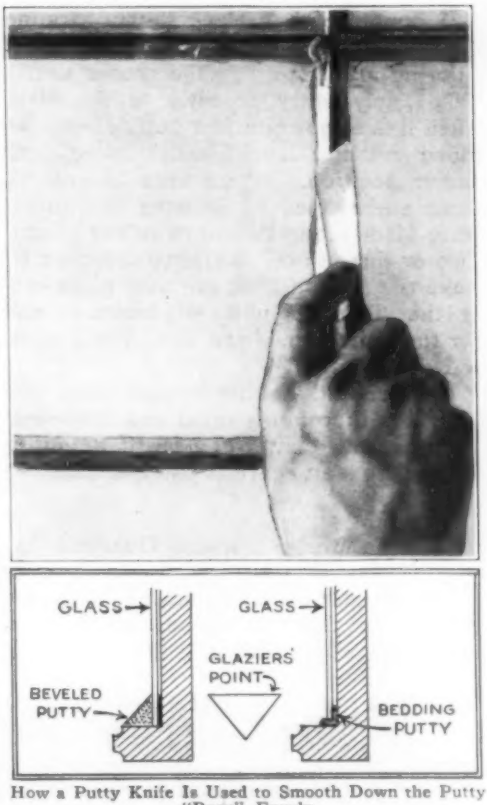
After the glass is entirely removed and the loose putty picked away from the frame, the latter should be scraped clean with a putty knife to remove all hardened lumps. Glass is far from flexible and if a new piece has to be forced in, it probably will crack. If the woodwork has been dug out or splintered, these defects should be remedied by filling uneven spots either with putty or a plastic wood paste. The latter dries like wood and can later be finished with woodworking tools and sandpapered down to match the frame.

After the frame has been cleaned, it should be primed with good paint or white lead and oil. This is to fill the pores of the wood as well as to offer a surface for the putty to cling to. If no paint is applied, the drying putty will eventually pull away from the bare wood. Two coats of paint are better than one, if the time can be taken to allow the first coat to dry. Some glaziers prefer using shellac for the first coat and some use only one coat of shellac.

If you do not feel competent to measure and cut the glass yourself, have it done at the shop where you buy it. If you cut your own glass, cut it ⅛ in. smaller than the inside measurements of the sash opening, to allow for uneven breaking of the glass and any bumps in the wood that may have been overlooked. Cut the glass on an absolutely level bench. An old marble slab is ideal for this purpose. Be sure that the surface on which the glass is laid is free from grit or dirt. Little bits of dirt under the glass will almost always cause fractures when pressure is applied.

Before placing the glass in the sash, run a thin backing of very soft putty around the inside of the opening against the stops. This provides a soft bed for the glass to rest on and against, and also prevents water from leaking in as it runs down from the sweating glass. It is amazing how rapidly this moisture will work under the glass if such a putty backing is not provided. This will quickly rot the wood and materially hasten crumbling of the outside putty. Press the glass gently against this putty bed and insert the glaziers' points against the outside of the glass. Do not use too many, and press them firmly into the wood with the thick edge of a flat tool, such as a chisel. Never strike the points if it can be avoided, and be careful not to press the point or the tool against the glass. Just allow the point to clear the glass and press directly down on its top edge with the tool. If glaziers' points cannot be obtained you can use old phonograph needles or even small brads. Regular points, however, are preferable. Force the point well down into the wood to within at least ⅛ in. of its top, to insure that it will be well covered with putty.

Puttying a window light is an art and not everyone can do a workmanlike job. However, going at it in the right manner helps considerably. A great deal depends on the consistency of the putty and the kind of knife used. The tool preferred by most glaziers is one having a rather long blade, about 1½ in. wide and fairly flexible. One corner should be rounded slightly and the other ground sharp. Thus the putty can be drawn along the glass to a feather edge with the rounded side and the corners molded nicely with the sharp one. The flexible blade is preferable to a stiff one because the "give" takes up some of the unevenness of the hand pressure when running the putty, and produces a more even surface than a stiff blade.



How a Putty Knife Is Used to Smooth Down the Putty "Rope" Evenly

There are many brands of good putty on the market; most of them consist of a mixture of whiting and linseed oil, ground to a thick paste and kept in air-tight containers. The chief trouble with such putty is that it is short-lived under severe weathering even when protected with sufficient paint. It can be made at home by simply mixing whiting and linseed oil on a sheet of glass with a putty knife. A better putty can be made, however, by using equal parts of whiting and white lead, stirring these parts well together and then adding just enough linseed oil to give the proper consistency. This putty will not crack or crumble like that made of whiting alone and will last from three to four times as long as the latter under similar conditions.

Sometimes, to match the house trim, it is desirable to color the putty. This can be done by the addition of dry coloring mat-

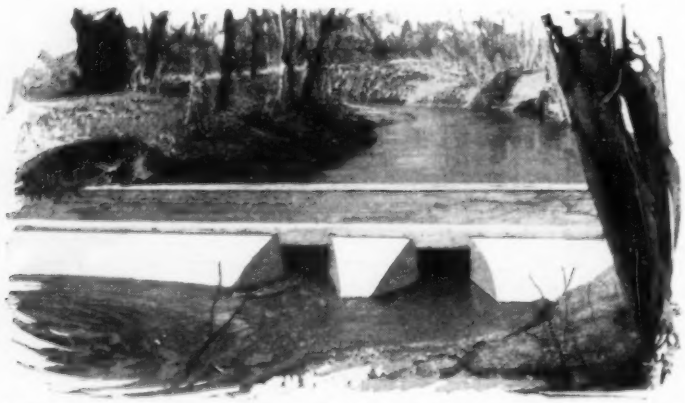
ter: lampblack for black putty, carmine for red putty, and so on. Use only enough coloring matter to give the proper tint.

To apply putty properly to the glass when it is in position, the putty should be rolled out in a long, slender "rope" and laid in position. It can then be pressed down and shaped by drawing the putty-knife blade along as shown in the photo. Two or three times should be sufficient to make the fill and then the next piece can be laid. Too thick putty will bunch up under the knife and, if too thin, it will stick and draw out.

Paint should not be applied until the putty has thoroughly dried and hardened. This may be a matter of a few days, but it will pay to wait. Fresh putty, if painted, will eventually cause the paint to crack and peel because of shrinkage as it hardens. Give the putty at least two coats of paint, allowing several days for the first coat to dry. Daubs of putty, oil and paint can be removed from the glass by first scraping off the putty with an old razor blade and later scrubbing the remaining smut off with warm vinegar. This will also aid in softening any dried paint, after which the glass can be cleaned with cleaning compound. Paint remover can also be used for the preliminary cleaning, but care should be taken to prevent it from touching the paint, the putty or the woodwork. Any remaining putty should be kept for future use and can be preserved by placing it in a jar of water.

Simple Bridge Permits Overflow

A creek near Floral, Kans., washed away every bridge that was built at one location before the bridge shown in the photo was



Low Concrete Bridge Permits Flood Water to Run over It, to Prevent Washout, While Normal Flow Passes through Openings

constructed. The openings in the concrete are large enough to carry the normal flow of the stream. When the spring rains bring the big flow, which usually lasts but a short time, the surplus water passes over the top.—S. Russell, Winfield, Kans.

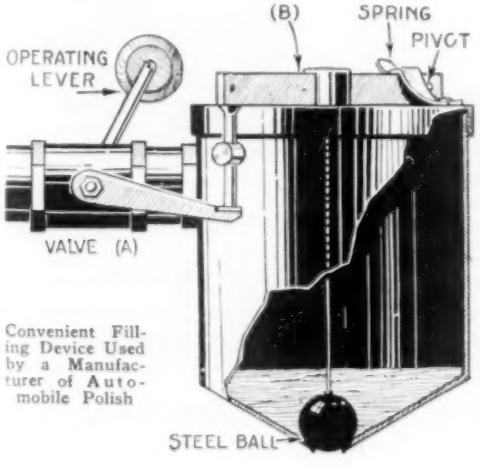
Relining Brake Bands

Like many a Ford owner, I repeatedly have to go to the trouble of removing the transmission-case cover, starter, etc., in order to reline the brake band. Two out of three times, the clutch and reverse bands are still in good condition and all that labor has to be performed just to reline the brake. I would have liked to install a set of quick-change bands but could not afford the initial cost. One day when the brake gave out, I resolved to try using only one of the quick-change bands, already lined, which cost about 80 cents. After purchasing one, I drained the oil out of the transmission and removed the plate. With an old, sharp screwdriver I sliced off the first two rivets on the left-hand ear of the brake band. Removing the nut, slotted washer and spring, I slipped the brake pedal out of the case so that I was able to turn the band to the right. After a short effort, I succeeded in cutting off the third rivet. With a little prying, the ear left the band and permitted me to slip the band out from the right-hand side. I was all ready now to slip in the new relined brake with its patent removable ear. The band slipped down all right but wouldn't come up again. Finally I pulled the band out, threaded a stout wire through the left-hand side and hooked it on the raised rivet of the band. Again threading the band through

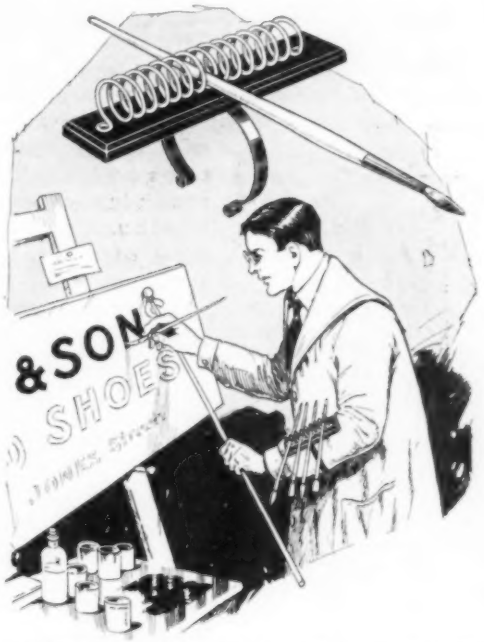
the right-hand side and pulling steadily on the wire from the left, the band adjusted itself nicely and correctly into place. Locking the car and reassembling the brake pedal took only a few minutes. I then flushed the case with kerosene to remove any rivet chips, refilled it with oil, replaced the plate, and found that the work had only taken about 1½ hours, whereas it formerly took fully 3½ hours to reline the brake in the old way. Now, with the patent band already installed, it takes only about 25 minutes to reline it.—Geo. W. Boehmer, Portland, Oreg.

Labor-Saving Filling Device

The filler shown in the illustration has helped a western manufacturer of automobile polish solve the problem of efficient canning. An ordinary gate valve, A, is provided, and to one side of this is fastened a lever for hand control. On the other end of the valve shaft is attached an arm for operating the trap mechanism B. When the valve is completely closed, the steel ball in the bottom of the trap is raised, allowing the liquid to flow through the bottom opening into a container. When the valve is opened, the steel ball drops and closes the opening, so that the trap can be rapidly filled. While this is taking place, the operator is replacing the previously filled container with an empty one, and the process is repeated. The trap is constructed of heavy brass, and is fitted with a screw top, which can readily be removed for cleaning.



Convenient Filling Device Used by a Manufacturer of Automobile Polish



Coil-Spring Pen Rack and Cyclists' Trousers Guard Make Good Brush Holder for the Sign Painter

Holder for Sign Painters' Small Brushes

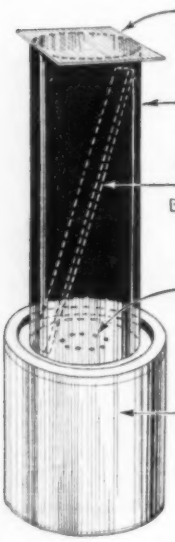
Sign painters often work in positions where they are much inconvenienced in keeping a selection of small brushes at hand and ready for instant use. This was overcome by a Wisconsin sign writer by soldering a coil-spring pen rack onto a cyclists' trousers guard. This improvised holder can be clamped on the worker's forearm and will hold quite a number of brushes at one time.—G. E. Hendrickson, Argyle, Wis.

Repairing Marble

With a little practice any mechanic can repair holes, cracks or chipped places on marble slabs, so that the patched place cannot be detected from the natural marble. Use the following mixture as a base for the filler: Water glass, 10 parts; calcined magnesite, 2 parts, and powdered marble, 4 parts. These should be mixed thoroughly to a semifluid paste. Fill the crack or hole and smooth off level, then with a camel's-hair brush and colors, made of aniline in alcohol, work out the veins, body colors, etc., as near to the natural marble as possible.

Improvised Wood-Steaming Chamber

When pieces of wood have to be bent they should be steamed to make them pliable. A quickly improvised device, which will do the work thoroughly is shown in the illustration. It consists of a 1-gal. sirup can and a section of stovepipe with a piece of wood or sheet metal for a cover. Holes are punched in the lid of the pail near the center. The stovepipe is set on the lid over the holes, the piece of wood is placed inside of the pipe and the cover put on. The can, partly filled with water, is placed over a slow, steady fire. Steam rises into the stovepipe and, after the wood has been steamed for about 10 minutes, it is usually as pliable as desired, and can be removed for bending.—O. W. Timm, Eagle Rock, Calif.

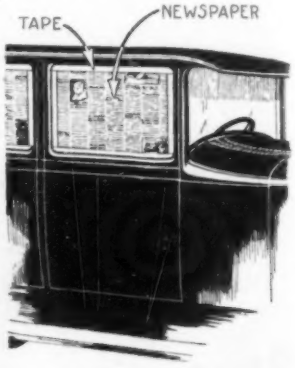


Harness Hanger

On my little farm are a number of labor-saving devices, the best of which, I think, is my method of hitching and unhitching, which is similar to that used in fire-engine houses. In the barn, directly over the point where the horse stops, two single pulleys are attached to the ceiling, and one double pulley is attached to the ceiling near the side wall. A sack filled with enough sand to make it a little heavier than the harness and shafts, is tied with two sash cords, which run up to the double pulley, branch out to the two single pulleys, and then drop to the level of a horse's back, where they are fitted with large hooks, one to catch in the saddle on the back band, and the other to catch the harness just in front of the crupper. The buckles on the harness are replaced with snaps. Patent fasteners are placed on the hames and collar. These can be obtained at any harness shop. The horse is driven under the device and stopped at a point where the front hook is directly over the saddle. The two hooks are attached to the harness, the belly band, hames and lines are unsnapped, and the harness and shafts are lifted from the horse by the weight. The whole operation requires less than two minutes. This method of hitching and unhitching has other advantages. As stated, there are no buckles to unfasten, which is a great convenience, especially on a cold or wet night. The traces, hold and back straps, and lines, all remain fastened to the wagon. The harness is never in the mud or dirt, nor does it become misplaced. To hitch up takes no more time than unhitching. The whole outfit of pulleys, sash cord, snaps, etc., costs less than a dollar.—H. P. Ijams, Knoxville, Tenn.

Protecting Glass When Painting Auto

A spray gun is often used in painting cars, and if the paint comes in contact with the glass, it means a few hours' additional work to clean it. This trouble can be prevented by the use of old newspapers and adhesive or friction tape. The sheets of paper are held against the glass and the tape is used as a binding that fits closely along the edges of the glass, leaving none of it exposed. When the fenders are to be painted in a color differing from that of the body, the same plan may be used to prevent the paint from getting on the parts that are not to be painted. Sheets of tin, about 8 by 10 in. in dimensions, are inserted between the running-board shields and the body. This idea is applicable whether you use a brush or spray, and will save quite a bit of labor when painting window frames of any kind.



¶A machine should never be stopped in the midst of a fine cut.

How to Etch Brass and Copper

By H. N. DURHAM

ETCHED brass and copper articles are at present enjoying a wide popularity. The process of making these pieces is very simple and can be carried out by anyone without any special equipment or great outlay of money for material. Briefly, the steps in the process are laying the ground, cutting and biting. The first involves the coating of the object with an acid-proof layer of varnish. This layer is cut with a sharp point to bare the metal in places, according to a selected design, whereupon the object is immersed in an acid bath which eats away the unprotected parts. The metal is then cleaned and the whole process is complete.

The ground or acid-proof varnish is a mixture of rosin and wax, which is soluble in turpentine and can be easily melted. One can either buy it already prepared or make it at home. The following formulas have been found to be very satisfactory: A transparent ground may be made by putting 1 oz. of rosin and 2 oz. of white beeswax in a small dish and heating it over a gentle flame until the rosin and wax simmer and are thoroughly mixed. The mass is then allowed to cool, removed from the dish and formed into a small ball, which is tied up in a stout piece of silk cloth. Another ground, slightly more troublesome to make but giving better results, is made by melting

FIG. 2

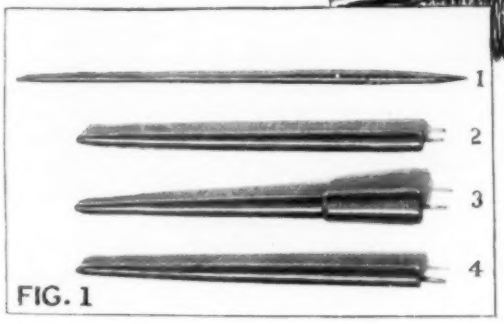


FIG. 1

2 oz. of finely powdered asphaltum over a small flame and adding 1 oz. of Burgundy pitch and 1½ oz. of white beeswax. The whole melted mass is stirred to thoroughly mix the ingredients, then poured into warm water and further mixed by kneading in the hands, after which it is made up into balls as before. Liquid grounds can be made by dissolving either of the

above in turpentine so as to produce a free-flowing solution.

The etching points can be made from phonograph needles, or from a pointed bar of steel. They may be mounted in a piece of wood, shaped like a penholder, by forming a hole in the flat end of the wood and pressing the blunt end of the needle into it. The sharp point of the needle should then be ground off by rubbing on an emery stone or emery paper. The needle should be so held and turned during this operation as to produce a ball-pointed end. Several such needles will be needed and should be ground to different degrees of bluntness, as indicated in Fig. 1, for lines of different widths. A needle with a flat end, like a screw-driver blade, will also be found useful for very wide lines.

FIG. 3

The etching solution is made by dissolving 4 oz. of ferric chloride in a pint of water and adding 1 oz. of concentrated hydrochloric (muriatic) acid. This will etch reasonably fast and can be handled without danger. A quicker solution can be made either by substituting nitric acid for the hydrochloric, or by diluting one part of nitric acid with six parts of water and adding a little sal-ammoniac—about a teaspoonful to 1 pt. of diluted acid. Either of the above solutions may be made more vigorous by increasing the proportion of acid, but this must not be overdone, as the ground will break down if the acid is too concentrated.

In addition to the above materials, there will be needed some tailors' wax, turpentine, a small camel's-hair brush, carbon paper, a ruler and a pair of dividers.

The objects to be decorated may be of any shape desired, but they should have a comparatively large smooth surface on which to place the design so it will show up to advantage and will not be lost in the confusion of the rest of the ornament. They may be either brass or copper, as the procedure with either is the same. The article should first be thoroughly cleaned to remove all traces of grease, by immersing it in a solution made by dissolving two tablespoonfuls of caustic soda (or lye) in 1 pt. of water. It is then washed in either hot or cold water until all the caustic soda is removed, and dried by rubbing with an absorbent cloth, care being taken not to touch with the fingers the portions to receive the design.

If the ground is to be used as a ball, the article is warmed over a gas flame, holding it with a pair of pliers, until it has become a little warmer than is just necessary to melt the ground. It is then held with one hand and the ball, tied up in a piece of stout silk (Fig. 2), rubbed over the entire surface, coating it with a thin film. If the film is uneven the object may be again heated, this time a little hotter, to spread out and smooth the coating. If the film is too thick, heat it quite strongly, but not so hot as to make it smoke, and tilt it so the excess ground will run off the edge. Liquid ground is laid in an entirely different manner; a quantity of the ground, considerably more than is needed to coat the surface evenly, is poured from the bottle onto the object while it is held horizontally. It is then tilted from side to side, to cause the ground to run and evenly coat the entire upper surface, taking care that it does not run over the edge. When the object has been completely and evenly coated the surplus liquid is poured back into the bottle. A little practice is needed to effect an even and clean coating in this manner, but once the knack of it is ac-

quired, there will be no difficulty. The object should then be allowed to dry, and when practically all the turpentine has evaporated, it may be heated to hasten and complete drying, thus hardening the coating. As soon as it has cooled, the ground will be hard and ready for proceeding further with the work.

It is usually desirable to transfer the entire design to the surface to be decorated before actual cutting with the point is started. If the design one wishes to use has been recently printed, as, for instance, designs in newspapers, the transfer is easily accomplished by merely placing the printed side of the paper against the waxy coating and rubbing the back of the paper with the finger nail or the bowl of a spoon. This will transfer a clear copy of the design to the ground, which will show very well, especially on transparent ground. If the paper is old and the ink dry, the sheet should first be moistened with turpentine. If it is not practicable to use printed impressions, you can make a tracing of the design and place this on the uncoated side of a sheet of carbon paper, which is then placed over the surface to be etched. The design is traced with a sharp medium-hard pencil to transfer it onto the ground. The entire design may thus be transferred or only the prominent parts of it; in the latter case, the details and fine lines are put in by free-hand work while cutting the ground.

Having transferred the design to the ground, the cutting may be started, using one of the fine points. The hand, during the cutting, should rest on some support at about the same level as, or higher than, the part on which one is working. The point should be grasped as one would hold a pen or pencil and drawn over the ground with just sufficient pressure to cut through the ground. If too great pressure is used, the point will scratch the metal below, and make corrections more difficult. After all the lines have been put in, the design may be touched up and those lines which are to be wider in the finished design broadened with one of the blunter points. For the widest lines, and those which are to vary from narrow to wide, use the flat-pointed tool held in an upright position. Mistakes are corrected by applying some of the liquid ground over the line with a very fine brush, being careful that the ground does not run into some of the lines

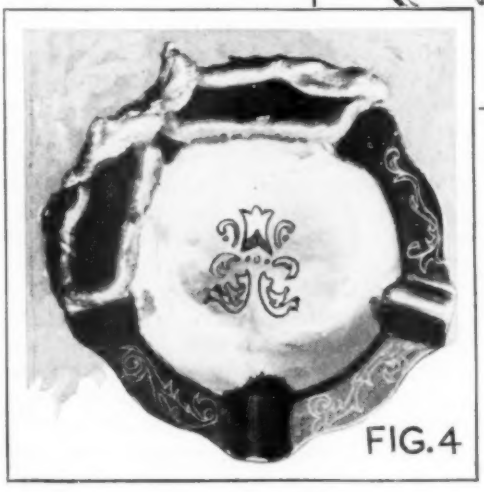


FIG. 4

correctly cut. For very fine work, a magnifying glass, Fig. 3, held in the left hand so the movements of the point can be accurately observed, will be helpful.

Small designs on large objects should be built up with a wall or dam of wax around the part to be etched. (See Fig. 4.) A piece of wax is taken in the hand and worked until it is plastic, and is then drawn out into long strips which are placed around the design and firmly pressed against the ground. This wall should be built up until it is about ½ in. high, so the inclosure will hold an appreciable quantity of acid. The acid is poured over the design until it nearly fills the inclosure and is left while the actual etching is carried out. The time required for the etching will have to be determined for each individual set of conditions, and will usually be somewhere between 30 and 60 minutes. Progress can be observed at any time, however, and after a single trial, the proper time can be accurately determined. If desired, one can pour out the acid, determine the depth of the bite and replace the acid if it is of insufficient depth.

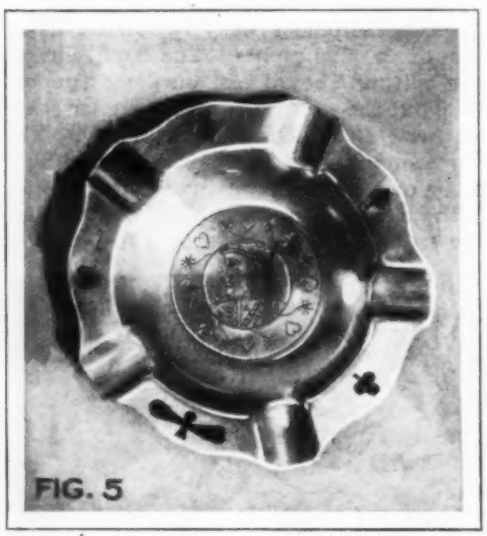


FIG. 5

With most designs it is desirable to have certain parts of the design deeper than other parts, or some parts may be etching too rapidly, for some reason or other. If so, the shallowest parts of the design should be etched to their full depth, the acid removed and the surface dried. The fully etched parts are then stopped out by applying some of the liquid ground with a fine brush. As soon as this has dried, and it must not be heated to hasten the drying, the acid can be poured over the design again and the etching of the metal continued.

As soon as the etching has proceeded far enough the article is washed and the ground removed by wiping it with a rag moistened with turpentine. The turpentine should leave the metal perfectly clean; if one application does not take off all the ground, repeat with a clean piece of rag.

Scratches may be removed or covered by taking the high polish from the object, either by rubbing the surface with an abrasive or by immersing the article in the etching bath for a few minutes. This will produce a fine grain on the surface, dulling it and making it better in appearance. It is well to give this treatment to all articles which are likely to become scratched in use. Fig. 5 shows a completed job.

If certain parts of the design need retouching, the object should be entirely covered with transparent ground and the lines to be deepened or widened cut through this and the article re-etched.

Additional decoration can be produced in any of the following ways: The engraved lines may be filled with molten metal; they may be filled with a colored substance, or they may be treated with a chemical to turn them dark. The effects can be endlessly varied in this manner and with many designs the addition of a little color lends much to their attractiveness.

To fill the lines of the design with a molten metal, the ground is carefully cleaned off in the usual manner and the whole surface is covered with fine-powdered tin or solder. The object is then tilted and tapped gently to cause the surplus to be removed, or the surplus may be removed by lightly touching the design with a soft brush. Then heat the object to melt the powdered metal remaining in the lines. Dust or powder from filing or similar operations forms a suitable substance to be used in thus filling the lines.

The same general procedure is adopted to fill the lines with colored material and, for this purpose, powdered sealing wax will work well. Brilliant colors may thus be obtained, and even several colors can

be produced on the same piece in the following manner: The entire design is coated with sealing wax of one color and the surplus removed as for single-color work. The wax in those lines which are to be of another color is removed by brushing it from the lines with a fine stiff brush, and the object heated to melt the wax. The remaining lines are filled in the same manner and the object again heated. If the lines are to be merely darkened, the object is not washed after the final etching, and the etching solution is replaced by a solution of a sulphide, such as sodium sulphide. This forms a black compound with the brass or copper and provides a very durable color which is not easily rubbed off.

Etching is not only interesting but very decorative, and useful gifts can be made in this manner. It can also be made a very profitable source of income if one has the time to devote to it.

Rapid Method of Coloring Backgrounds

A southern manufacturer of bas-relief aluminum signs uses a rapid method of coloring the backgrounds neatly without having to "cut in" carefully with a brush around the lettering. He uses brushing lacquer in bright colors, which dries almost immediately. The workmen, who need not be skilled, simply apply the lacquer over lettering and all. Then they quickly wipe a blotter wetted in gasoline over the surface of the raised letters, removing the color there without disturbing

Quick Method of Lacquering Backgrounds of Bas-Relief Cast-Aluminum Signs

the background. This method is not only very fast but also economical.—R. T. Bly, Birmingham, Ala.

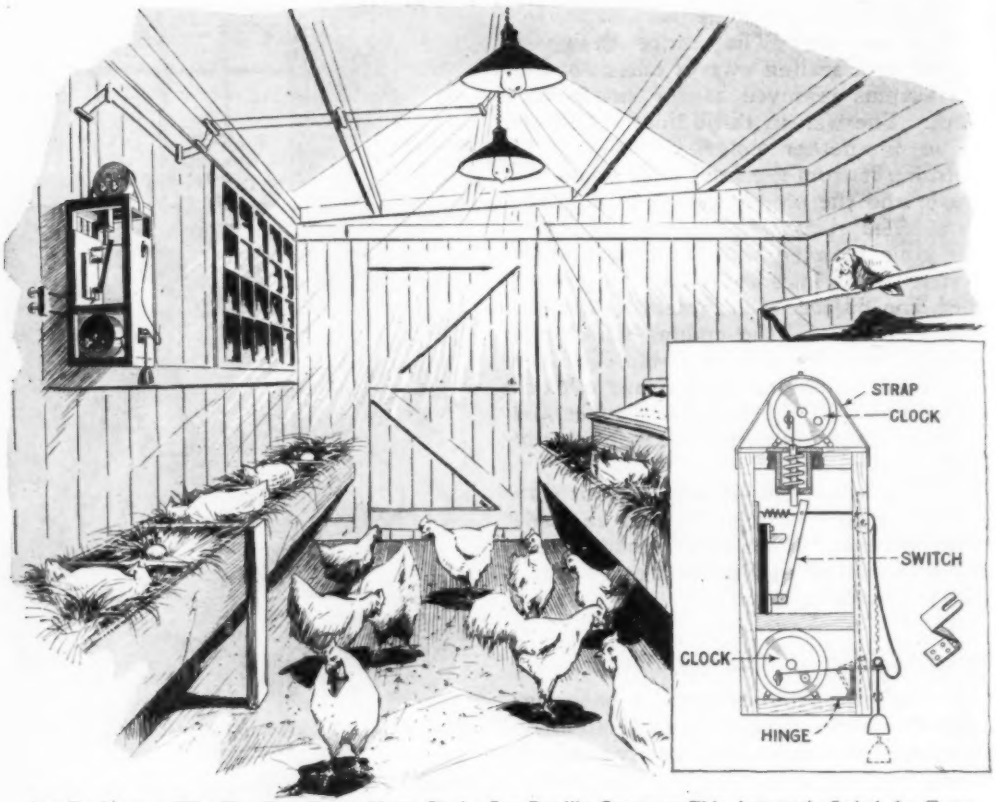
Coiling Rope in Washtub Facilitates Carrying It and Prevents Tangling

Coiling Rope in Tub Makes Job Easy

Anyone who has had occasion to use a large coil of rope knows how difficult it is to handle it, due to its bulkiness and tendency to tangle. A sand-blast company, which uses much hemp rope for hoisting scaffolds, has an employe who conceived the idea of coiling the rope in a large galvanized tub. In this way he eliminates the problems of handling and storing it. The tub can be picked up and moved about easily without dropping a portion of the coil, which would invariably result in a tangle.

Keeping Plaster of Paris Soft

For the ordinary repair job around the home and shop, plaster of paris sets too quickly. I have found that, by using equal parts of strong vinegar and water, in which the plaster is mixed, the process of setting can be delayed for 15 to 30 minutes. One teaspoonful of cream of tartar to each quart of water is also effective.—Julion Close, Elmira, N. Y.



Any Poultryman Who Has Two Extra Alarm Clocks Can Readily Construct This Automatic Switch for Turning the Hen-House Lights On and Off to Increase the Hen's Working Day

Automatic Switch for Poultrymen

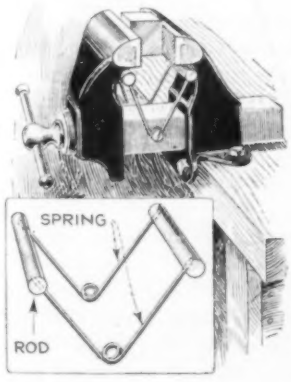
Poultrymen have found that using electric lights to lengthen the hen's working day increases profits. To turn the lights on and off automatically, a western man built the simple alarm-clock operated device shown in the illustration. It can be made as follows: Build a two-compartment box of 1-in. stock, of such dimensions that an alarm clock, with its bell and clapper removed, fits snugly in the lower section, with about 1½ in. to spare at one side, while the upper section has a 2-in. clearance above the handle of a s.p.s.t. knife switch. Get a light strap hinge and bend 1½ in. of the end at right angles. Cut a slot, 1 in. long, as shown in the detail. Cut a hole through the side of the case to permit the movement of this forked end, and screw the hinge to the bottom as indicated. Mount the switch vertically in the upper compartment. A 4-in. length of ⅝-in. hardwood dowel stock is pierced 1 in. from the end with a piece of a small nail, against which a washer is placed to take the thrust of a light coil spring. The upper end of this assembly passes through a 7/16-in. hole in the case, suitably placed, and over the lower end a small guide box of ¼-in. stock is slipped, to be nailed to the case. Allow the nail ends to project through saw kerfs in the guide-box sides, both to prevent the plunger from falling out and to prevent twisting. Tie a stout string to the upper end of the hinge, and wind it around the button of the alarm spring of the clock in such a direction that, when this revolves, the string will pull the hinge. Mount another alarm clock on top, fastening it with a leather strap, as shown. Connect the switch plunger with the alarm button by means of a string. Close the switch, and cut a light spring (a curtain spring will do) to hook between the handle and a screwhook in the opposite side of the case. Tie a string to the handle, pass the other end through a hole

the case and over a small pulley, and tie to it a weight of about ½ lb.

To start the device, set the lower clock for the time of turning off the lights, the fork of the hinge projecting horizontally beyond the case. Set the upper clock for the time that the lights are to be turned on, opening the switch and allo ing the plunger to snap down behind the blade and hold it there against the tension of the spring. Tie a nail to the weight string in such a position that, when rested on the fork of the hinge, the string above will hang slack. When the time comes for the lights to go on, the button of the upper clock revolves, lifting the plunger, whereupon the spring closes the switch. At turning-off time, the lower clock operates, withdrawing support from the weight, which drops and pulls open the switch against its spring tension, where it is locked by the plunger. It is, of course, necessary to wind the clocks daily in order to keep the device running.

Spring Opener for Work Vise

After a bench vise has been in use for a considerable length of time there is a certain amount of backlash in the screw, and the movable jaw does not respond when the vise is opened until the handle has been turned, in some cases, almost twice. To remedy this defect, a spring was made, which presses the jaws apart, so that the vise opens immediately the handle is turned. The device consists of two springs, which are driven into two rods, and is fitted between the jaws, as shown in the drawing. The one we made had sufficient pressure to open the jaws 3 in. We found the spring particularly handy when repetition work was done and the vise had to be opened and closed often.—Harry Moore, Montreal, Can.



Pipe Carrier for Drain Tiles

When a large piece of ground is to be drained many tiles have to be carried to the drain ditches and deposited in position. With the carrier shown in the drawing, this work can be lightened considerably, as with it, the tiles can be picked up, carried and deposited without so much stooping. Connect two lengths of ½-in. pipe with two elbows and a nipple, as indicated. This can be arranged to suit, but room enough for the hand must be left between the tile and the handle. By making the bottom pipe sufficiently long, two tiles can be carried at a time, if desired. Protect the tile by slipping an old piece of rubber hose over the pipe. A short piece of hose on the handle will also make a better grip.—L. B. Robbins, Harwich, Massachusetts.

Handy Tile Carrier Made of Pipe and Fittings Eliminates the Necessity of Frequent Stooping

Polish for Ferrotype Plates

Paraffin, dissolved in gasoline is an excellent polish for photographers' ferrotype plates. A tablespoonful of paraffin in 1 pt. of gasoline is a good proportion.—Philip S. Mentz, Jefferson Barracks, Mo.

BUILDING A "PRISCILLA" SEWING CABINET

By Edwin M. Love

THE usefulness and simplicity of this sewing cabinet especially adapts it to home construction. Built of mahogany, or of red gum stained to imitate either mahogany or walnut, it is a handsome piece of furniture. Only 1-in. stock need be bought, as the thinner wood for lids and tray can be made from this by surfacing down, or by ripping with a handsaw.

The ends of the cabinet are detailed in Fig. 1. Rule a 6 by 26-in. piece of cardboard with lines 1 in. apart, forming squares, by which the curved outline of half the leg can be copied. The straight edges slope 1¼ in. in 8 in. of length. The lower end is cut in an arc of 3¼-in. radius, with a smaller circle above of ¾-in. radius, centered 3¾ in. above the lower end. Cut out the pattern, and trace on 1 by 12-in. stock, using a center line as a guide.

Shape a cabinet end, using the larger tools where possible, since they cut fast. Smooth the edges carefully, and, if desired, trim the corners of the ends, below the box itself, to give the edges a semicircular profile. On the inner face, centering on the stock, cut a ½ by 1¼-in. mortise, ½ in. deep, to receive the stretcher tenon. Make the mortise accurately, since the gluing surface is small, and the joint should be as strong as possible.

On the inner face make a groove, ¼ in. deep and ¾ in. wide, parallel to each edge and ¼ in. from it. The shape of the end permits the plow plane to be used with a through stroke, without the end of the joint being exposed to view. Make the other end exactly like the first.

The two sides, detailed in Fig. 2, are rectangles, 8¾ by 12 in., cut from 1-in. stock. In one edge of each cut a rabbet ⅜ by ½ in., tipping the plane to slope the shoulder so that the bottom will make a tight joint with the side inside, when assembled. Since this joint is not depended on for great strength, it may be undercut to insure a tight contact. Size the ends with thin glue to partly seal the pores and lay aside to dry.

Make the stretcher of 1-in. stock, 12½ in. long. Rip and joint it to 2 in. in width, rip a new edge 3¾ in. from each end and ½ in. from the upper edge, and curve up to the edge with a radius of ½ in., leaving the raised part 4 in. long. In the same way cut back the lower edge ¼ in. for a distance of 4½ in. from each end, finishing with arcs of ¼-in. radius and leaving the raised center 3 in. long. Smooth the edges, and, centering on the ends, with the lower edges flush with the stretcher edge, make tenons, ¼ in. thick, 1¼ in. wide and ½ in. long. Glue the ends to the sides and stretcher, test for squareness, and put aside to dry while making the lids and bottom.

For the bottom, rip to a thickness of

⅜ in. a piece of 1-in. stock, 8 in. wide. The thin piece ripped off, when smoothed up, can be used for building the tray. Square the bottom to the dimensions shown in Fig. 3. The two lids are rectangular pieces of ½-in. stock, 6¼ by 14 in. in size.

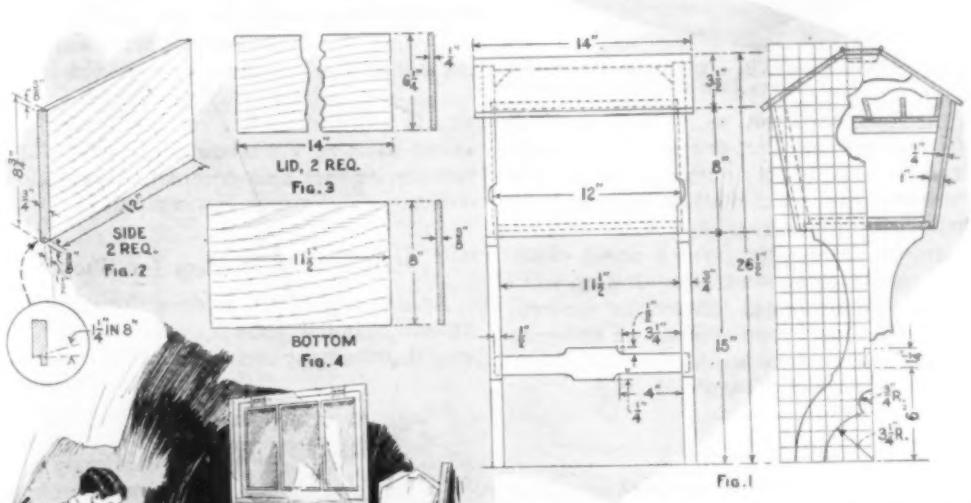
Joint the sides of the cabinet flush with the top, taking care to avoid splintering the ends, and glue and nail on the inner faces of the ends, flush with the side rabbets, two lengths of ⅜-in. quarter-round, which act as backing cleats for the ends of the bottom. Put the bottom in place, smooth side up, and nail to the sides with four-penny finish nails. Toenail the ends with 1-in. brads.

To support the tray, glue and nail two ⅜ by ¾ by 6-in. cleats to the ends, as shown in Fig. 1, adding small stop blocks at the ends, to keep the tray from sliding forward. Fig. 6 shows the hanging rail, which is a piece of 1-in. stock, 1½ in. wide, with edges beveled ⅛ in., and the ends notched ¼ in. deep and 1¼ in. long. Glue this between the upper ends of the cabinet ends, and when the glue has set, reinforce the joints with triangular brackets, cut from 1-in. stock, glued and nailed underneath. Bevel the upper edges of the lids to fit against the rail edges, and hang with 1 by 1-in. hinges, placed 2 in. from the ends. Mortise the sides into both the rail and the lid edges.

MATERIAL LIST

1 piece, 1 by 12 in. by 6 ft., mahogany or red gum.
1 piece, 1 by 10 in. by 4 ft., mahogany or red gum.
2 pairs, 1 by 1-in. brass fast-pin butts.

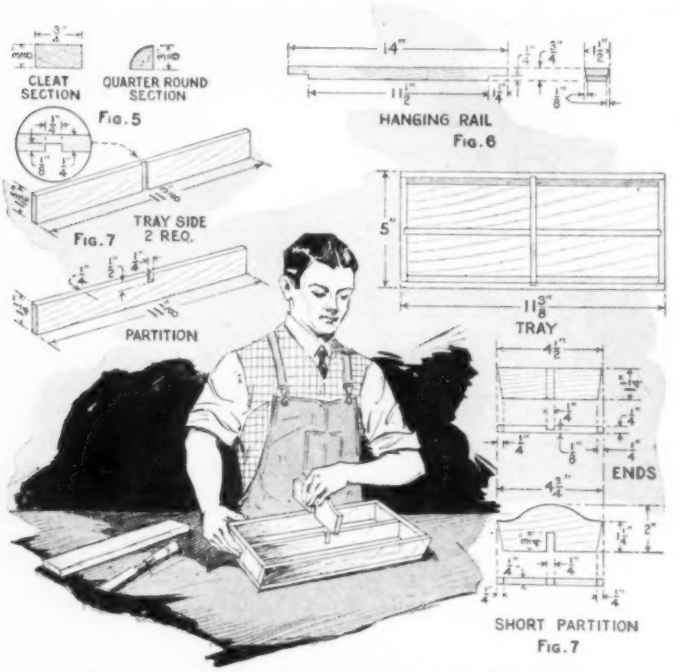
The tray parts are detailed in Fig. 7. Cut two ends from ¼-in. stock, 1¼ in. wide and 4½ in. long, with the ends sloped ¼



Details of Side, Lid and Bottom of Priscilla Sewing Cabinet; Also Front Elevation, and Layout of End, with Part Section

in. On the inner faces make grooves ⅛ in. deep and ¼ in. wide, as shown. The short partition is similar to it, except that the upper edge is curved up for ¾ in. to provide a finger hold and, instead of being grooved, is notched from the bottom ¾ in.

The sides are of ¼-in. stock, 1⁵⁄₁₆ in. wide and 11⅜ in. long, grooved across the grain, ⅛ in. deep and ¼ in. wide. Nail these to the ends, grooves in, and joint the edges flush with the ends. Then put



Details of Tray Construction, Cleat and Hanging Rail; the Bottom View Shows How the Tray Is Assembled

in the long partition, which is ¼ by 11⅛ in., notched in the center ½ in. deep. Straddle the short partition over this. Glue all joints. Nail the bottom, and joint flush with sides and ends.

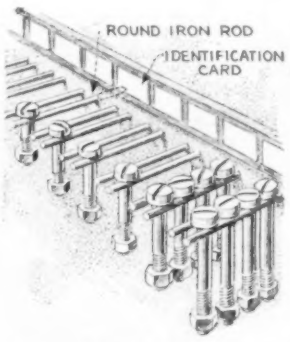
Sponge the cabinet with a damp cloth, to raise the grain, and after drying, sand to glass smoothness. Stain as desired, leaving the inside unfinished. If red gum is used, one coat of boiled linseed oil and two of wax make a beautiful finish.

Fumigating School Books

Many times children are found in school who are suffering from some contagious disease and who are not sick enough to stay at home, and the books and other articles which have been used by them are a source of danger to other pupils. I devised a way to fumigate these articles whereby they can be disinfected at once and at very little cost. A can having a screw top and a place for a candle at the bottom is used for this purpose. A carbide can will do nicely, as it is about 2½ ft. high and about 15 in. in diameter and the top can be screwed down tightly to keep in the gas. Formaldehyde candles are used. They are set in a small tin can about 1½ in. in diameter and ½ in. in height. They can be obtained at a slight cost and each one is sufficient to fumigate 1,000 cu. ft. A hole is cut in the bottom of the large can so that it will admit the upper part of the candle, but the fit must be tight. The books are then placed in the can, so that they are not directly over the hole and the can is raised off the floor enough to permit the lower part of the candle to be inserted in the hole. The top of the can is screwed down firmly as soon as the gas begins to issue forth. The candle is allowed to burn about one minute or until the can is well filled with gas. The gas is allowed to act on the books and other articles for about 7 hours. This insures perfect and complete fumigation. —George T. Palmer, Springfield, Ill.

Handy Bolt Holders for Shop

By using the bolt holders shown in the drawing, much time can be saved that would otherwise be wasted in hunting through an accumulation of bolts thrown carelessly in a drawer or box. Hung up on the holders, the bolts will always be in plain sight, being arranged according to size, thread, etc., so that they can readily be found. The holders are made by driving lengths of steel rod into holes drilled in a wall, slightly more than head-high. The rods are spaced in pairs, parallel and just far enough apart to



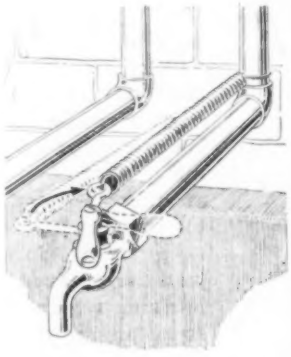
allow a bolt shank to be slipped between them. The bolts hang down by their heads. A board can be nailed above the holders and cards tacked to it, one above each holder, to indicate the size of the bolts. This method will be found a great convenience near a planer or other similar machine, or in a shop using bolts of various sizes in large quantities.

Non-Slip Drawing Board

I have an uncleated drawing board which I use a great deal on a larger table board. To prevent it from slipping, I got an old piece of rubber-covered extension cord, which is close to 7/16 in. in diameter, cut two lengths of the cord, still in fair condition, cleaned them off and tacked them to the back of the board with small brads, sinking the heads of the brads below the rubber. These lengths of cord make the board easier to pick up and prevent it from slipping.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Automatic Shut-Off for Shop Faucet

Often a water faucet in the shop is left running with the result that there is considerable waste. To put a stop to this, one shop owner fixed the faucet so that it would turn off automatically. It was used in connection with a cleaning tank and it stood out from the wall at the end of a short pipe as indicated. The spigot was removed and a small hole drilled through it at right angles to the handle. The hole was tapped for a screweye with a nut at the end. Then one end of a coil spring was wrapped around the pipe just above the elbow and the other end attached to the screweye. It is easy to see that the spring will shut the water off with a snap as soon as the handle is released.—Harry Moore, Montreal, Can.



Hanger for Heavy Harness

To care for a heavy work harness in the stable in a proper manner, it must be supported on hooks high enough to keep the trailing ends off the damp and usually dirty floor. As it is difficult, however, to lift the heavy pieces to the necessary height and arrange them conveniently, one ingenious farmer resorted to the employment of the holder shown in the drawing. It is made from a length of 2 by 4-in. oak and a discarded fork handle, a hole being drilled through the upper end of the 2 by 4-in. piece. The nails are driven into the wall, one about 4 ft. above the floor and the other several feet higher. In use, the holder is suspended from the lower nail, the harness put on the fork handle, and the whole is then lifted to the second nail.

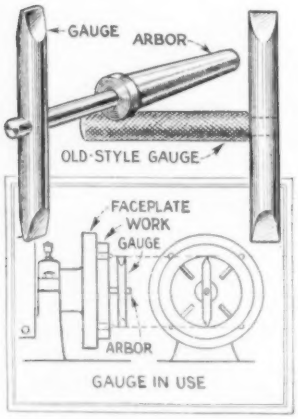
Simple Method of Raising Heavy Harness to Proper Height in Stable

Old Gaskets Used Over Again

When you are unable to obtain gaskets for your auto, the old ones can perhaps be used, even if they are thin, provided they are not broken. Get some soft string, such as candle wicking, and lay this on the gasket. A little cup grease may be used to hold it in place.

Self-Centering Ring Gauge for Lathe Work

One of the difficulties encountered in the boring of large-diameter rings, flanges, etc., in the lathe, is the gauging of the work as the boring progresses. We used to have end gauges with a handle for this work, but found that considerable time was required to enter the gauge centrally and squarely, owing to the size of the hole. The trouble was overcome, however, in a simple and practical manner by knocking the handles out of the gauges and using an arbor piece in the lathe, turned on the front to enter the hole in the gauge. We made this piece long enough to allow the gauge to be slipped on it before reaching the work. As these gauges were ground to size on the ends using the hole to chuck them on an arbor, it is obvious that the gauge was presented to the work squarely by slipping it on the arbor and sliding it up.—Harry Moore, Montreal, Can.

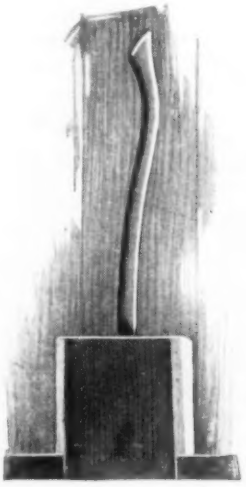


Inexpensive Cuts for the Multigraph

In offices where a multigraph is used for printing forms, announcements and other similar matter, it is often desirable to use a cut if an inexpensive one could be obtained. Simple line cuts, where the design is not too intricate, can be made of cork linoleum, which is used for running boards of automobiles and is easily obtained. It is of the proper thickness for the purpose, as it nearly corresponds to the height of the type. The carving away of the unnecessary cork can be done with small knives made from broken hacksaw blades, ground down on an emery wheel to the proper shape. It should be remembered that only the parts of the design to be reproduced should remain untouched; all other space must be undercut sufficiently so that it will not take the ink. Also, the design must be drawn in reverse, especially if lettering is included. Designs can be transferred by means of carbon paper or can be drawn by hand directly on the surface of the linoleum. Lines should be fairly broad. When used with type, these cuts can be brought to the proper height by putting sheets of paper under them. The clips used to hold the type in place can also be used to hold the cut in position and, as the linoleum can readily be bent in any direction, no difficulty will be experienced in making it conform to the curve of the printing drum. Two-color effects can be obtained if the designs are carefully matched and properly placed on the drum. This is particularly effective if a solid design is used for a background with the main features of the design brought out in a contrasting ink through the use of a second cut. While these cuts are only intended as cheap substitutes for regular electrotypes, they will stand up for several thousand impressions and will lend variety and charm to otherwise ordinary work.—O. W. Blake, Oakland, Calif.

Handy Ax Holder

Keeping an ax sharp is an easy matter if the head is held in a small wooden box nailed to the wall, as shown in the photo. Besides protecting the ax from becoming dull, due to lying around and getting in contact with other tools, and from being mislaid, which is so often the case, the box can be filled with oil-soaked sawdust to protect the tool against rust. The box is made of 1-in. material and its dimensions should be such that the ax head can readily be accommodated in it.—J. R. Kuntz, Bremen, Ind.

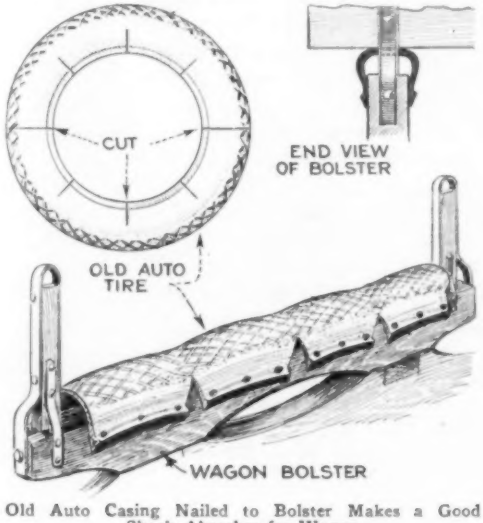


Uses for Old Emery Wheels

Broken emery wheels should not be thrown away. There are many uses for them about the house or home shop. Take pieces of different grades and grits; have a chunk as coarse as No. 40, a piece of No. 80 and a piece of No. 100 or 120, if possible. Every machine shop has broken wheels that can be had for the asking or at a nominal price, and they will save many a quarter for sharpening pocketknives, table hardware, scissors, pruning shears, hatchets, etc. For carpenters' tools, of course, a piece of grindstone is better than the emery wheel, but soft, fine grades of the latter will do in a pinch. Autoists will find it a handy thing in their tool box for touching up commutator parts while on the road.

Novel Shock Absorbers for the Farm Lumber Wagon

Lumber wagons on the farm are noisy and rough-riding, even when driven over the smoothest roads and fields, and especially when empty. One ingenious farmer devised a pair of simple shock absorbers that eliminate much of the jolting. A discarded auto casing was cut in two and each half slashed as shown so that it could be straightened easily. The halves were nailed onto the bolsters to serve as cushions for the wagon box.—G. E. Hendrickson, Argyle, Wis.



Old Auto Casing Nailed to Bolster Makes a Good Shock Absorber for Wagon

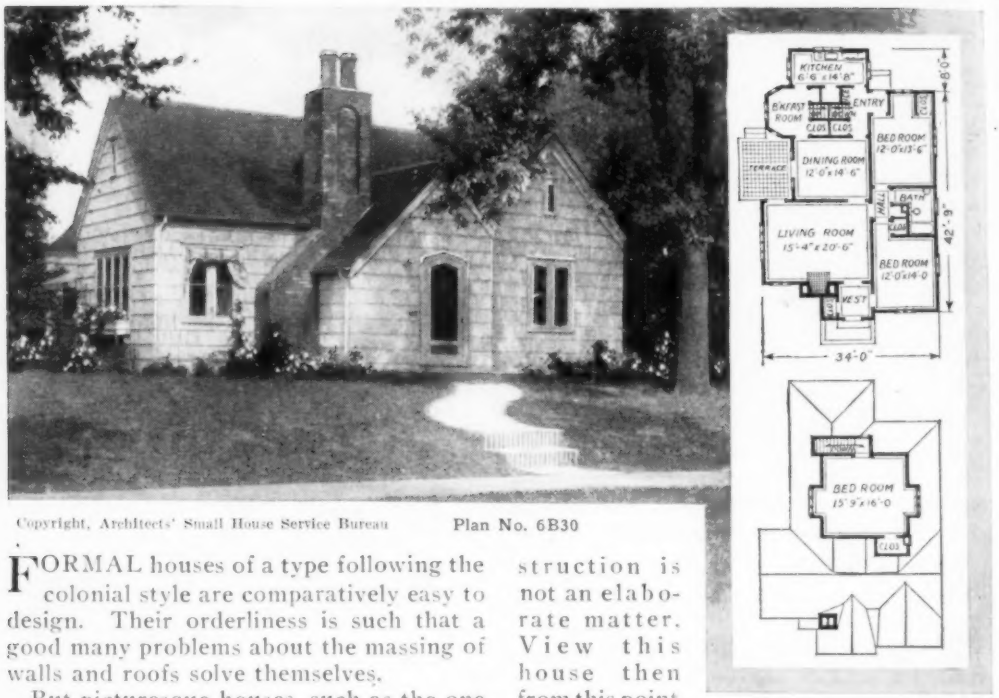
Simple Barbed-Wire Fence Tightener That Is Easily Made from an Old Spring Leaf

Tightener for Barbed-Wire Fences

Barbed wire is usually rather difficult to stretch and many devices for tightening such wire have been made, but the one shown in the drawing has been found to be among the best. It can be made from a large spring leaf, cut off so that it is about 24 in. long, and has a handle ground at the straight end. The curved end should be cut down or ground down to a point. About a third of the way from the point, a long narrow notch is cut in the center of the tool, running down toward the point. Make it similar to a hammer claw. In use, the tool is held vertically and the wire is slipped into the slot so that, when the point is brought against the post and the handle is pulled, the wire can readily be drawn tight, while an assistant staples the wire to the post.—L. B. Robbins, Harwich, Mass.

¶Vaseline is a good cleaner for commutators while machines are in operation and under load.

Is This Your Home?



Copyright, Architects' Small House Service Bureau Plan No. 6B30

FORMAL houses of a type following the colonial style are comparatively easy to design. Their orderliness is such that a good many problems about the massing of walls and roofs solve themselves.

But picturesque houses, such as the one illustrated here, are more difficult to design. The organization of these houses follows no definite form. Here the massing of the plan elements greatly influences external appearances. The size and shape of rooms must have such an interrelation that the general exterior effect is fine. Architects call this composition.

Now, if no limitations are placed on the architect as to the way in which he may model the plan, no restrictions as to cost or size, he finds the problem of composition or modeling somewhat easier. But for a small house, such as the one shown here, this liberty does not exist. The plan must be organized so that after all the work is done economy still remains. The house must be of such a type that its construction is not an elaborate matter. View this house then from this point of view. The plan is straightforward, easy to build, essentially of an economical type. The framing follows a definite procedure. It would necessarily be a little more expensive to construct than a house that had an absolutely rectangular form, yet the difference in cost is not great.

To this six-room house—the sixth room being in the second story, a single one, over the dining room—have been added vestibule, breakfast room, pantry, terrace and a generous fireplace. Going over the plan, one finds countless details of interest. There is abundant closet space, a kitchen lighted on three sides, a breakfast room, which in the morning should be bathed in sunlight. Size of lot required is forty-five to fifty feet, and construction wood.

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the United States department of commerce. Please inclose 10c in stamps or coin. Blueprints, specification forms, and material lists for the house shown here may be obtained from the Architects' Small House Service Bureau for a small fee. If further information is desired, literature describing the plan service and publications of The Architects' Small House Service Bureau will be sent you upon request. A booklet entitled "50 Ways to Lower Home Service Costs," illustrated by ten Bureau homes actually lived in and showing how as much as $1,000 can be saved on a home, may be obtained for 20c.